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Cordium indicum Lamarck, 1819
(Fig. 1A-D, Fig. 2C)

Cordium hions Brocchi, 1814: p. 508, pl. 13, fig. 6 (non Spengler, 1799).
Cordium indicum Lamarck, 1819: p. 4.
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Boss K.J., 1982. Mollusca, in Parker S.P. (ed.), *Synopsis ond Clossificotion of Living Orgonisms*. Vol. 1. McGrow-Hill, New York: 945-1166.
Carter J.G., Campbell D.C. & Campbell M.R. 2000. Cladistic perspectives on early bivalve evolution, in Harper E.M., Taylor J.D. & Crame J.A. (eds), The Evolutionary Biology of the Bivalvia. *Geologicol Society, London, Speciol Publicotions*, **177**: 47-95.
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New data on *Stenoplax veneta* (Mollusca: Polyplacophora: Ischnochitonidae) from the Oligocene of Italy

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Abstract

Stenoplax veneta Dell'Angelo & Palazzi, 1992 was described from the Lower Oligocene (Rupelian) of Case Soghe (Arcugnano, Vicenza), on the basis of four valves, the holotype (a tail valve) and three paratypes (a head and two tail valves). Only a tail valve (paratype) was figured in dorsal view, and so many characters of the species were not adequately illustrated. The new material found in recent years, in the same outcrop, consists of five valves (two intermediate and three tail valves), enabling to improve the main characters description of this rare species, which is the only known from the Oligocene of Italy.

Key words

Ischnochitonidae, Systematic, Oligocene, Case Soghe, NE Italy.

Riassunto

Stenoplax veneta Dell'Angelo & Palazzi, 1992 è stata descritta per l'Oligocene inferiore (Rupeliano) di Case Soghe (Arcugnano, Vicenza), sulla base di quattro piastre, l'olotipo (una piastra posteriore) e tre paratipi (una piastra anteriore e due piastre posteriori). Solo una piastra posteriore (paratipo) è stata illustrata in vista dorsale, e pertanto molte caratteristiche della specie non sono state supportate da una documentazione adeguata. Recentemente, nella stessa località, è stato rinvenuto del nuovo materiale, cinque piastre in tutto, due intermedie e tre posteriori, che ci consente di completare la descrizione di questa rara specie, l'unica conosciuta nell'Oligocene italiano, ed illustrare più dettagliatamente i suoi principali caratteri diagnostici.

Parole chiave

Ischnochitonidae, Sistematica, Oligocene, Case Soghe, Italia settentrionale.

Introduction

The knowledge of the chiton fauna from the Cenozoic of Italy has been greatly developed in recent years, with many works relating to Neogene (Laghi, 1977; Dell'Angelo & Palazzi, 1989; Dell'Angelo et al., 1999, 2001, 2012a, 2013, 2014; Chirli, 2004; Dell'Angelo & Bonfitto, 2005). Very scarce are instead the data from Paleogene, with only two records, a single indeterminate chiton valve (Genus indet. sp.) from the Middle Eocene (Lutetian) of the Grola Quarry (Cornedo Vicentino, Vicenza) (Dell'Angelo et al., 2012b) and a species described from the Lower Oligocene (Rupelian) of Case Soghe (Arcugnano, Vicenza), *Stenoplax veneta* Dell'Angelo & Palazzi, 1992. The latter was so far known by a few (one head and three tail) valves only. Newly collected material comprises also intermediate valves, permitting us to redescribe and illustrate this rare species.

Materials and methods

The collected chiton valves were found by one of the authors (E. Quaggiotto) and by Luca Bertolaso (Reggio Emilia) and Paolo Mietto (University of Padova) in the outcrop of Case Soghe, during many years of research in the Monti Berici area. The valves were collected both manually inside the exposure of the sediments and by picking after the wet-sieving (sieve mesh width 0.5, 1.0, and 2.0 mm) of bulk samples.

The Oligocene outcrop of Case Soghe (**Fig. 1**), located in the eastern-central side of Monti Berici (near Monte Lungo, Arcugnano, Vicenza, NE Italy) was first discovered and described by Rossi (1962); it is composed of whitish sparcely fossiliferous limestones, of lagoon origin pertaining to the upper fraction of Lower Oligocene (Upper Rupelian). The samples were collected in a small exposure of brownish yellow silty sandstone capping, in stratigraphic unconformity, a "Pietra di Vicenza" quarry near Case Soghe (Mietto, 1988, 1997). The overlying levels described by Rossi (1962) are formed by a series of arenaceous-clayey levels of volcanic origin, including a fauna of corals and molluscs, studied by Accorsi Benini (1971, 1974), rare decapod crustaceans (De Angeli & Beschin, 2008; De Angeli et al., 2010), and plant remains (Charrier, 1962).

In the sampled strata shells are not abundant (Dell'Angelo & Palazzi, 1992), and generally in far better condition respect to similar aged samples coming from other Venetian outcrops; the finer details of the sculpture are also sometimes preserved, but this is quite rare and more commonly they are scantily visible. Fig. 2 shows the status of the outcrop of Case Soghe (Vicenza) in 2008.

Fig. 1 - Location map.

Fig. 1 - Ubicazione dell'affioramento.

The following abbreviations are used:
BD = B. Dell'Angelo collection, Genova, Italy (will be deposited to MZB).
MGP-PD = Museo geo-paleontologico dell'Università di Padova, Italy.
MZB = Museo di Zoologia dell'Università di Bologna, Bologna, Italy.

Systematics

Order Chitonida Thiele, 1909
Suborder Chitonina Thiele, 1909
Family Ischnochitonidae Dall, 1889

Genus *Stenoplax* Dall, 1879

Type species
Chiton limaciformis Sowerby, 1832, by original designation.

Remarks

Stenoplax is a distinct taxon whose members are highly elongate, and whose intermediate valves have prominent sutural laminae and generally raised lateral areas. The depressed and much more elongated tail valve (relative to other valves) with prominent diagonal line is diagnostic for this genus.

Distribution

East Pacific Ocean (from Canada to Peru), Indo-Pacific Ocean (from Japan to India), Indian Ocean (Madagascar), West Atlantic Ocean (from Florida to Brazil). Eocene - Recent.

Stenoplax veneta Dell'Angelo & Palazzi, 1992
Figs 3A-L

Stenoplax veneta Dell'Angelo & Palazzi, 1992: 27, figs 1-3.
Stenoplax veneta - Schwabe, 2005: 104.
Stenoplax veneta - Dell'Angelo et al., 2011: 941, 953.
Stenoplax veneta - Dell'Angelo et al., 2012b: 27.
Stenoplax veneta - Dell'Angelo et al., 2014: 51, pl. 1, figs 1-9.

Material examined

Case Soghe: holotype (tail valve, MZB 10301) and three paratypes (a head and two tail valves, BD 3039, **Figs 3A-C, 3G-H**); 2 intermediate (maximum width 2.7 mm, **Figs 3I-J**) and 1 tail valves (width 4 mm, **Figs 3D-F**) (BD); 1 tail valve (MGP-PD 31475, width 3.8 mm, **Fig. 3K**); 1 tail valve (MGP-PD 31476, width 3 mm, **Fig. 3L**).

Description

Head valve (paratype) probably semicircular (it is made by a fragment about half of the valve, **Figs 3G-H**). Intermediate valve rectangular, anterior margin straight, posterior margin seem straight for the visible part, lateral area poorly defined, not distinctly separated by central area, only a sign of a diagonal fold between lateral and central areas is present, but hardly evidenced. Tail valve semi-elliptical, depressed, anterior margin almost straight, mucro subcentral, not elevated, antemucronal

Fig. 2 - Field image of the Oligocene outcrop of Case Soghe (Vicenza).

Fig. 2 - Veduta dell'affioramento oligocenico di Case Soghe (Vicenza).

slope straight or slightly convex, postmucronal slope almost straight just behind the mucro.
Tegmentum fully covered by small granules, irregularly disposed and some coalescing in head valve, lateral areas of intermediate valves and postmucronal area of tail valve, arranged in groups that seem obliquely directed in central area of intermediate valves and in antemucronal area of tail valve. Marked concentric lines of growth are visible on the postmucronal area of the tail valve.
Articulamentum with trapezoidal apophyses in tail valve, separated by a straight sinus, teeth short and irregular, slit formula: ? / 1? / 12-16.

Remarks

This is the sole described polyplacophoran species from the Oligocene of Italy. Originally it was described on four terminal valves only, and the morphology of the intermediate valves was unknown. A tail valve has been figured in dorsal view only, and some species characters were not sufficiently documented. The new material found in recent years consists of two intermediate and three tail valves, which for the first time allows a more comprehensive study, including the evaluation of the intermediate valves.
The valves are generally abraded and in some cases fragmented, making some characters (e.g. the apex, the profile, and the apophyses of the intermediate valves) still unknown. Also the lateral margin of the intermediate valve is not complete, and the slits in the articulamentum are not clearly visible, but it is possible to see tracks of the openings of a slit ray (**Fig. 3J**), so we can suppose that at least one slit is present.
There is a certain variability in the tail valve, the number of slits is 12 in the paratype (**Fig. 3B**), 16 in the BD valve (**Fig. 3E**), while the shape is much constant, the length/width ratio has a range between 0.70 (the holotype, see Dell'Angelo & Palazzi, 1992: fig. 1) and 0.74 (the paratype, **Fig. 3A** and the BD valve, **Fig. 3D**).

Not all characters of the species match those of the genus *Stenoplax*. The lateral areas of *Stenoplax* species are generally rather elevated (Kaas & Van Belle 1987: p. 124; Vendrasco et al. 2012: p. 34), but are little raised and poorly defined in our species. However, the same characteristic is seen in other *Stenoplax* species, e.g. *S. marcusi* (Righi, 1971).

The fossil record for *Stenoplax* is largely incomplete, and the few available records do not allow us to suggest a diversification scenario for the group. The oldest records are from the Eocene deposits of Europe, United Kingdom (Wrigley, 1943) and Ukraine (Bielokrys, 1999), and from the latest Eocene or earliest Oligocene of Washington, U.S.A. (Puchalski et al., 2008; Dell'Angelo et al., 2011). The only other fossil records of the genus *Stenoplax* are from the Miocene (Tortonian) of Italy (Dell'Angelo et al., 2014), the Plio-Pleistocene deposits of California, U.S.A. (Vendrasco et al., 2012 and the references listed therein), and an undetermined species from the Pleistocene of Japan (Itoigawa et al., 1976, 1978).

Distribution

Stenoplax veneta is known only from the Lower Oligocene of Case Soghe (Arcugnano, Vicenza, NE Italy).

Acknowledgements

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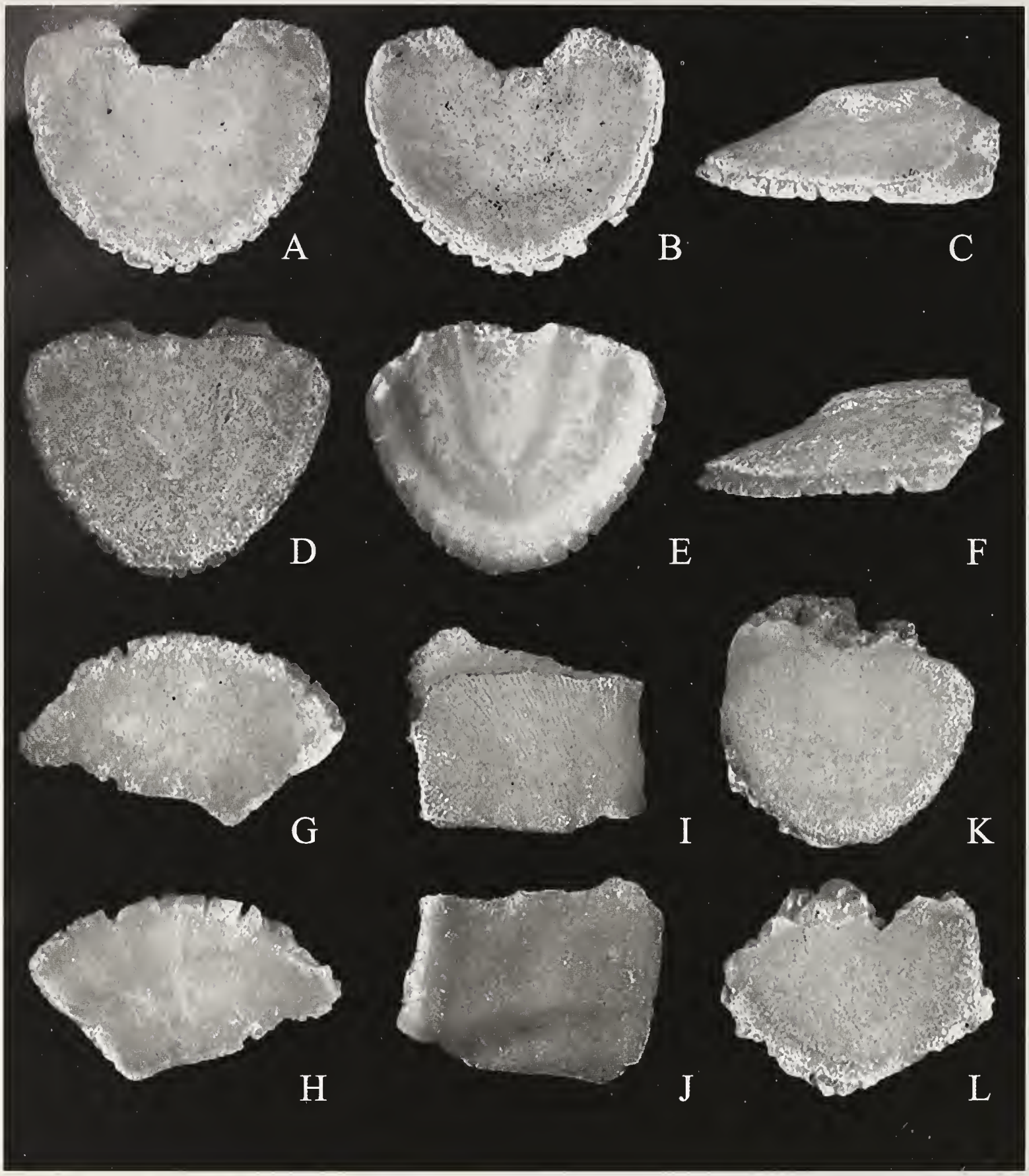

Fig. 3A-L. *Stenoplax veneta* Dell'Angelo & Palazzi, 1992, Case Soghe (Arcugnano, Vicenza), Rupelian Stage (Lower Oligocene). **A-C.** Paratype, tail valve, BD 3039, dorsal, ventral and lateral views, respectively. **D-F.** Tail valve, BD, width 4 mm, dorsal, ventral and lateral views, respectively. **G-H.** Paratype, head valve, BD 3039, dorsal and ventral views, respectively. **I-J.** Intermediate valve, BD, width 2.7 mm, dorsal and ventral views, respectively. **K.** Tail valve, MGP-PD 31475, width 3.8 mm, dorsal view. **L.** Tail valve, MGP-PD 31476, width 3 mm, dorsal view.

Fig. 3A-L. *Stenoplax veneta* Dell'Angelo & Palazzi, 1992, Case Soghe (Arcugnano, Vicenza), Rupeliano (Oligocene inferiore). **A-C.** Paratipo, piastra posteriore, BD 3039, viste dorsale, ventrale e laterale. **D-F.** Piastra posteriore, BD, larghezza 4 mm, viste dorsale, ventrale e laterale. **G-H.** Paratipo, piastra anteriore, BD 3039, viste dorsale e ventrale. **I-J.** Piastra intermedia, BD, larghezza 2.7 mm, viste dorsale e ventrale. **K.** Piastra posteriore, MGP-PD 31475, larghezza 3.8 mm, vista dorsale. **L.** Piastra posteriore, MGP-PD 31476, larghezza 3 mm, vista dorsale.

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Contribution to the knowledge of the molluscan fauna in the Marine Protected Area Tavolara-Punta Coda Cavallo: Ordo Nudibranchia

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Abstract
98 species of nudibranchs (Mollusca, Gastropoda) were recorded from the Marine Protected Area of Tavolara-Punta Coda Cavallo (North-eastern Sardinia) and its vicinities during the years 1989-2015. The most interesting species were annotated and shown in colour photos.

Key words
Nudibranchia, Northeastern Sardinia, Marine Protected Area Tavolara-Punta Coda Cavallo.

Riassunto
[*Contributo alla conoscenza della fauna di molluschi nell'Area protetta Tavolara-Punta Coda Cavallo: Ordine Nudibranchia*] 98 specie di nudibranchi sono state rinvenute nell'Area Marina Protetta Tavolara-Punta Coda Cavallo e nelle sue immediate vicinanze; le specie di maggior interesse sono commentate e illustrate con foto a colori degli esemplari viventi. Le ricerche sono avvenute in un ampio arco di tempo, dal 1989 al 2015.

Parole chiave
Nudibranchi, Sardegna nordorientale, Area Marina Protetta Tavolara-Punta Coda Cavallo.

Introduction

The Marine Protected Area (MPA) Tavolara Punta Coda Cavallo, created in 1997 by the Italian Ministry of Environment (law 979/82), is located in the north-eastern Sardinia and covers a surface of about 153.57 km^2. Cape Ceraso (40.919329° N - 9.644979° E) forms its northern border, whereas Punta L'Isuledda (40.765528° N - 9.695000° E) demarcates its southern limits. Tavolara, Molarotto, Molara and several minor islands are also included in the protected area. In the same area and in the vicinities 3 other conservation institutions inside the network Natura 2000 were realized:

1. "Isole del Nord-Est tra Capo Ceraso e Stagno di San Teodoro" (181.94 km^2) (ZPS ITB13019) which includes the same area of the MPA with the addition of sea and land between Capo Ceraso and Punta della Saline (40.915349° N - 9.579199° E);
2. "Isole Tavolara, Molara e Molarotto" (160.02 km^2) (SIC ITB010010) which overlaps the limits of the MPA;
3. "Stagno di San Teodoro" (8.2 km^2) (SIC ITB010011) which overlaps the two previous areas, with the addition of the land stretch corresponding to the coastal lagoon and its vicinities.

This paper deals with the 4 protected areas, including also the stretch of sea between Punta delle Saline and Lido del Sole (40.915936° N 9.567131° E), and reports the nudibranchs recorded in the area from 1989 to 2015.

Little work has been done on molluscan fauna of this interesting area; Porcheddu et al. (1998) listed 100 species from a range mainly equivalent of the zone dealt in this paper, but none Nudibranchia were included. In Cattaneo-Vietti et al. (1990), 6 Nudibranchia were recorded from Porto San Paolo Bay, 5 from locality Capo Coda Cavallo (*Goniodoris castanea*, *Felimida luteorosea*, *Cuthona ocellata*, *Carminodoris boucheti* as *Atagema* sp. and a *Discodorididae* sp. as *Aldisa* sp.) and 1 from locality Isola Rossa (*Cerberilla bernadettae*); other 2 photos by E. Trainito generically indicated "eastern Sardinia", regarded specimens of *Marionia blainvillea* and *Eubranchus farrani* found in Porto San Paolo Bay. Trainito (1990) reported 8 species (*Cuthona caerulea*, *Felimare tricolor*, *Felimida luteorosea*, *Eubranchus farrani*, *Flabellina affinis*, *Flabellina babai*, *Flabellina lineata* and *Diaphorodoris papillata*) from several localities (Isola Rossa, Isola Piana and Tavolara Island). *Carminodoris boucheti* was previously recorded from locality Porto Istana (Perrone & Doneddu, 1997), and finally *Doris bertheloti* and *Taringa armata* (Doneddu, 2010; 2011) were also already reported from the area Tavolara-Capo Coda Cavallo.

Materials and methods

The research concerned 62 localities, listed in **Tab. 1** and shown in **Fig. 1**. The geographical coordinates for each site have been done and at disposal of the MPA management, aimed to implement the GIS System adopted by the MPA: they are not reported here because some of them are located in C zone where sport fishing is allowed and lines could cause damage to fragile, exposed and low rate growing species. Some sites were more frequented than others, both for their accessibility also

with bad atmospheric conditions, and for logistic reasons. The result is that the number of species recorded and their abundance rank came out to be greater than in other localities. This does not necessarily mean that these sites are richer in species or specimens. On the other hand, no species were found in some stations (60= Relitto Mamma Elvira; 61= Tavolara Archetto; 62= Tavolara Punta Spalmatore).

N°	Localities	N°	Localities
1	Baia Bua	32	Omega wreck
2	Beach Rock Porto Istana	33	Oued Yquem wreck
3	Beach Rock Spalmatore	34	Reggiane wreck
4	Cala Coda Cavallo	35	Sassi Piatti
5	Cala Finanza	36	Scoglio Fico
6	Cala Girgolu	37	Secca Alessandrine
7	Cape Ceraso	38	Secca Angelo
8	Cape Ceraso Punta Ruia	39	Secca Aquarius
9	Costa Corallina	40	Secca del Papa 1 e 2
10	Costa Dorata	41	Secca del Siciliano
11	Isola Cavalli	42	Secca dell'Elefante
12	Isola di Reulino o Isola Rossa	43	Secca della Mandria
13	Isola Piana	44	Secca di Mezzo Canale
14	Isolotto Patron Fiaso	45	Secca Flabelline
15	Isolotto Rosso di Brandinchi	46	Secca Gerard
16	Isolotto Topi	47	Secca Gialla
17	Lido del Sole	48	Secca Monte Petrosu
18	Molara-Punta Levante	49	Secca Pasqua
19	Molara costa sud est (Cala Orate)	50	Tavolara Cala Cicale
20	Molara-Cala Spagnola	51	Tavolara Forni
21	Molarotto	52	Tavolara Grottone
22	Murta Maria	53	Tavolara Occhio di Dio
23	Porto Brandinchi	54	Tavolara Passaggetto
24	Porto Istana	55	Tavolara Punta del Papa
25	Porto Legnaiolo	56	Tavolara Punta La Mandria
26	Punta Arresto	57	Tavolara Scoglietto
27	Punta La Greca	58	Tavolara Tegghja Liscia
28	Punta Molara	59	Scoglietti del Fico
29	Punta Saline	60	Mamma Elvira wreck
30	Rada di Porto San Paolo	61	Tavolara Archetto
31	Chrisso wreck	62	Tavolara Punta Spalmatore

Tab. 1. List of the investigated localities.

Tab. 1. Elenco delle località esaminate.

Results

98 nudibranchs were found, out of a total of 272 (Trainito & Doneddu, 2014) present in the whole Mediterranean Sea (36.02%). For each species, data are listed in **Tab. 2**. Often living animals were photographed and, when necessary for the significance of the species, some specimens were collected and preserved.

The research concerned all year round through the years 1989-2015. Some nudibranchs were found under stones along rocky shores at low tide, in a depth range of 0-50 cm, one species (*Tethys fimbria)* was also found dead, shored after a storms. Most of the species were observed and eventually collected by snorkelling between 1 and 5 metres and by scuba diving of up to 56 meters depth. Dredging was never performed: this could be the reason why burrowing species, relatively common in other parts of the Mediterranean and often found during dredging surveys, were rarely found in the studied area (such as *Arminia tigrina*).

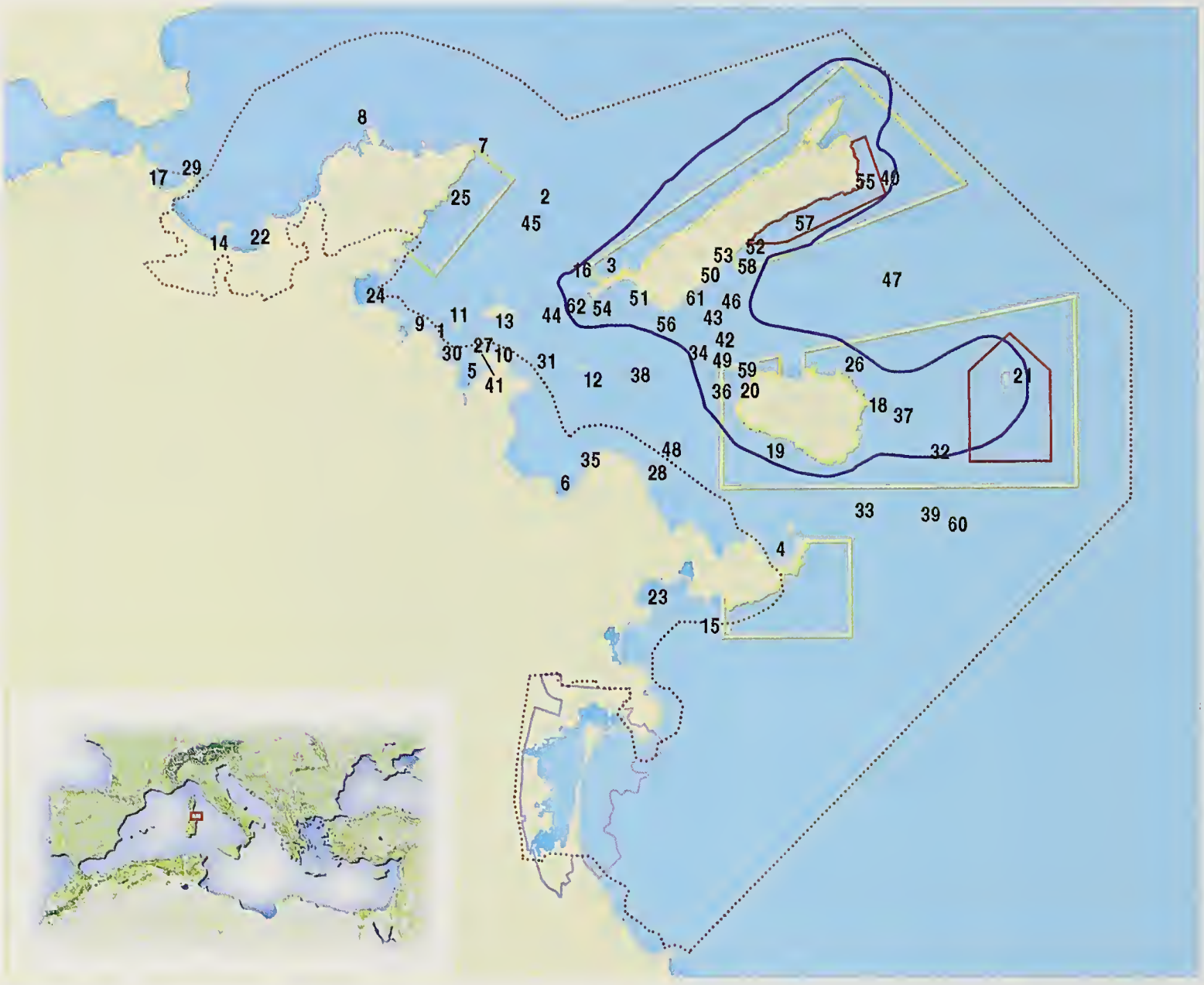


Fig. 1. Red lines MPA - A zone; yellow lines MPA - B zone; torquoise line: MPA C zone; Dotted line: ZPS ITB13019; blue line: SIC ITB010010; violet line: SIC ITB010010; the numbers indicate the 62 investigated localities.

Fig. 1. Linea rossa: MPA zona A; linea gialla: MPA zona B; linea turchese: MPA zona C; linea tratteggiata: ZPS ITB13019; linea blu: SIC ITB010010; linea viola: SIC ITB010010; i numeri indicano le 62 località investigate.

The wide range of time allowed us to record annual or multi-annual fluctuations in the findings of the various species. Indeed, some species relatively frequent in the 90s have become rare or completely disappeared in the following decade (such as *Taringa armata, Tayuva lilacina, Paradoris indecora, Discodorididae* sp. A, *Discodorididae* sp. B, *Aeolidiella alderi*), while others, rare or never found in the early years of the observations, have become relatively common in recent years (such as *Melibe viridis, Felimida elegantula,* species belonging to the genus *Doto, Facelina quatrefagesi*). Time trends in the abundance rank of species that showed significant variability, is shown in **Fig. 2**.

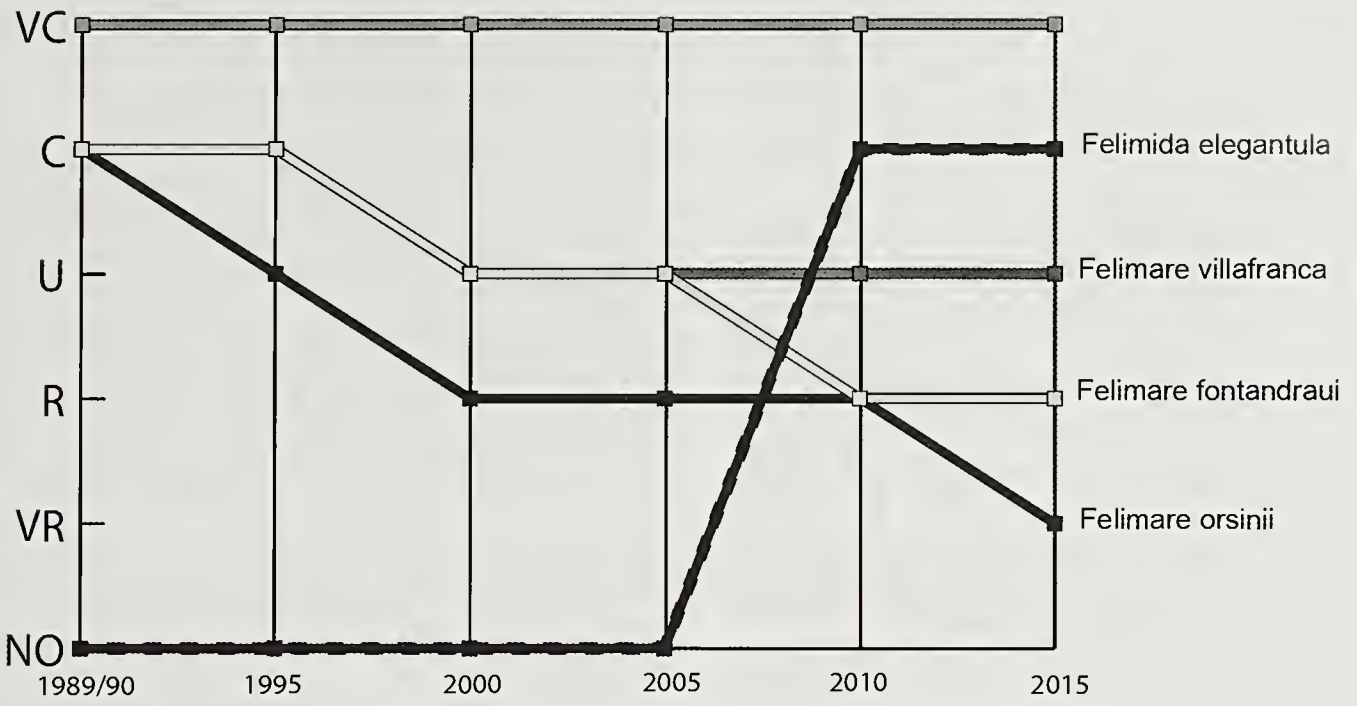
SPECIES	Abundance	Localities	Notes
Suborbo Doridina Odhner, 1934			
Family Onchidoridae Alder & Hancock, 1845			
***Onchidoris* sp.**	R	1, 30	1
Diaphorodoris luteociucta (Sars M., 1870)	C	5, 12, 27, 54, 58	
Diaphorodoris papillata Portmann & Sandmeier, 1960	C	12, 20, 29, 53, 58	
Family Goniodoridae H. & A. Adams, 1854			
Goniodoris castanea Alder & Hancock, 1845	R	1, 5, 17, 23, 30	
Trapania lineata Haefelfinger, 1960	VC	1, 11, 12, 17, 29, 30, 31, 41, 53, 55, 58	
Trapania maculata Haefelfinger, 1960	VC	1, 5, 11, 17, 30, 31, 41, 58	
Family Polyceridae Alder & Hancock, 1845			
Polycera quadrilineata (O.F. Müller, 1776)	C	5, 17, 29, 40, 41, 54	
Crimora papillata Alder & Hancock, 1862	R	16, 56	
Linacia clavigera (O.F. Müller, 1776)	R	50	
Polycerella emertoni Verrill, 1880	VR	17	2

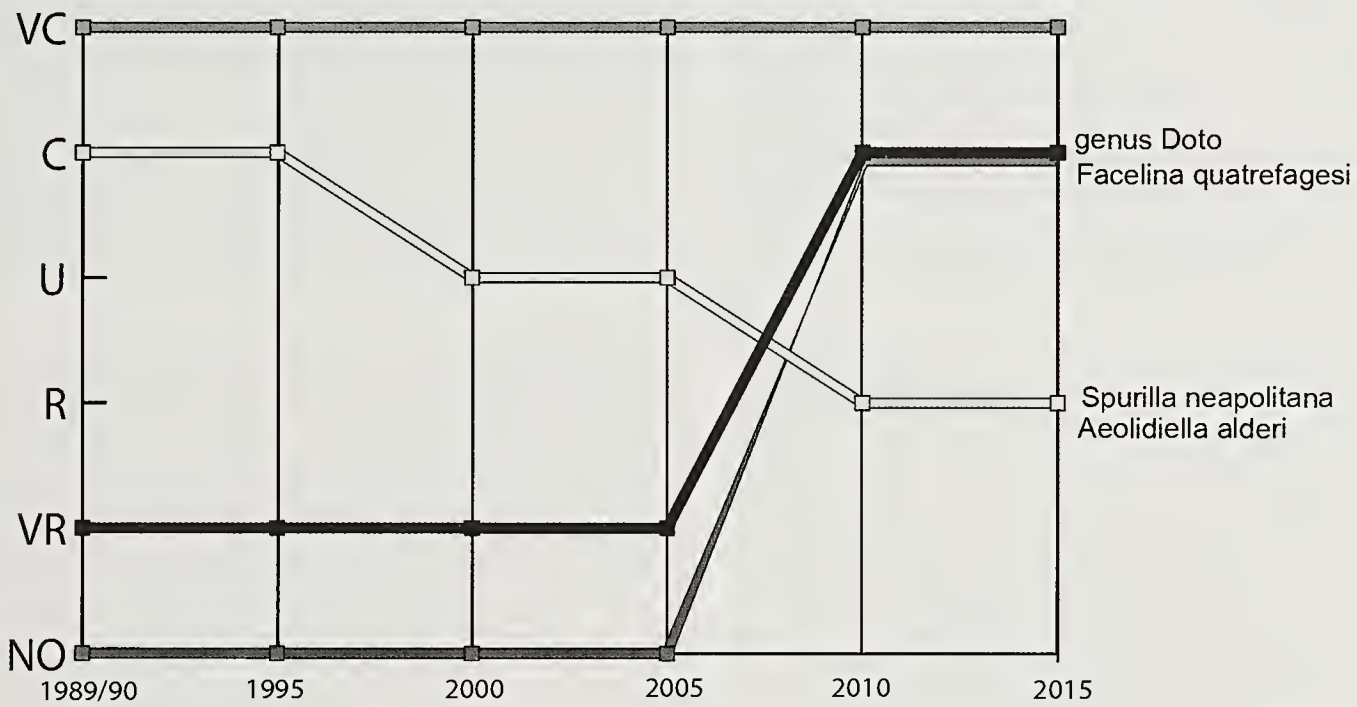
Family Aegiridae Fischer, 1883			
Aegires palensis Ortea Luque & Templado, 1990	VR	30	3
Family Chromodorididae Bergh, 1891			
Felimida britoi (Ortea & Perez, 1983)	U	1, 5, 29, 30	
Felimida elegantula (Philippi, 1844)	C	1, 14, 17, 22, 29, 30, 41	
Felimida purpurea (Risso in Guérin, 1831)	VC	1, 3, 4, 5, 6, 9, 10, 13, 17, 22, 23, 24, 25 29, 30	
Felimida krohni (Vérany, 1846)	VC	1, 3, 4, 5, 12, 13, 17, 22, 23, 24, 25, 30, 44	
Felimida luteorosea (Rapp, 1827)	VC	1, 3, 4, 5, 9, 12, 13, 17, 22, 23, 24, 26, 29, 30, 41, 50	
Felimare fontandraui (Pruvot-Fol, 1951)	C	1, 12, 24, 30, 36	
Felimare gasconi (Ortea, 1996)	VR	4, 30	5
Felimare orsinii (Verany, 1846)	U	24	
Felimare picta (Schultz in Philippi, 1836)	VC	1, 24, 29, 30, 31, 34, 35, 38, 39, 43, 44, 46, 47, 50, 51, 53	
Felimare tricolor (Cantraine, 1835)	VC	1, 4, 10, 25, 29, 30, 40, 44, 47, 50, 53, 58	
Felimare villafranca (Risso, 1818)	VC	1, 5, 7, 24, 29, 30, 41	
Family Doridiidae Rafinesque, 1815			
Doris bertheloti (D'Orbigny, 1839)	VR	12, 25	6
Doris ocelligera (Bergh, 1881)	VR	25, 27	
Family Discodorididae Bergh, 1891			
Tayuva lilacina (Gould, 1852)	C	1, 13, 14, 15, 17, 24, 30	7
Discodoris stellifera (Ihering in Vayssiere, 1904)	C	1, 4, 14, 17, 24, 29, 30, 41, 55	
Baptodoris cinnabarina Berg, 1844	R	5, 6, 17	
Carminodoris boucheti (Ortea, 1979)	R	4, 24	8
Jorunna tomentosa (Cuvier, 1804)	U	1, 24, 30	
Paradoris indecora (Bergh, 1881)	C	1, 5, 23, 24, 25, 30, 41	
Peltodoris atromaculata Bergh, 1880	VC	1, 2, 3, 12, 13, 20, 21, 26 30, 34, 35, 43, 44, 49, 50, 52, 53, 55, 58, 59	
Platydoris argo (Linné, 1767)	VC	1, 3, 5, 12, 13, 21, 24, 29, 30, 31, 44	
Taringa armata Swennen, 1961	C	1, 4, 6, 17, 24, 30	9
Discodorididae sp. A	U	1, 3, 13, 23, 24, 41	10
Discodorididae sp. B	VR	41	11
Family Phylidiidae Rafinesque, 1815			
Phyllidia flava Aradas, 1847	C	58	
Family Dendrodorididae O'Donoghue, 1924			
Dendrodoris limbata (Cuvier, 1804)	VC	1, 3, 4, 5, 6, 7, 12, 17, 20, 24, 25, 29, 30, 55	
Dendrodoris grandiflora (Rapp, 1827)	VC	1, 4, 7, 18, 24, 25 30, 55	
Doriopsilla areolata areolata Bergh, 1880	C	1, 5, S, 24, 30	
Suborbo Dendronotina Odhner, 1934			
Family Tritoniidae H. & A. Adams, 1858			
Tritonia lineata Alder & Hancock, 1848	R	30	
Tritonia manicata Deshayes, 1853	R	5, 10, 13, 43	
Tritonia nilsodhneri Marcus Ev., 1983	C	40, 50, 52, 53	
Tritonia striata Haefelfinger, 1963	VC	1, 11, 12, 15, 23, 29, 30, 40, 41	
Marionia blainvillea (Risso, 1818)	U	20, 55	
Family Shyllaeidae Alder & Hancock, 1855			
Scyllea pelagica Linnè, 1758	R	40, 53, 58	
Family Hancockiidae MacFarland, 1923			
Hancockia uncinata (Hesse, 1872)	R	29, 50	
Family Tethyidae Alder & Hancock, 1855			
Tethys fimbria Linné, 1767	U	5, 6, 7, 30	
Melibe viridis (Kelaart, 1858)	C	5, 17, 29, 30, 41	12
Family Dotidae Gray, 1853			
Doto acuta Schmekel & Kress, 1977	C	1, 30, 40, 43	13
Doto cervicenigra Ortea & Bouchet, 1989	C	12, 26, 40, 50	14
Doto coronata (Gmelin, 1791)	R	38, 43	
Doto caballa Ortea, Moro, Ocaña and Bacallado, 2010	VR	18	15
Doto koenneckeri Lemche, 1976	VR	29	16
Doto paulinae Trinchese, 1881	VR	40	17
Doto pontica Swennen, 1961	VR	40	18
Doto rosea Trinchese, 1881	U	38, 43	19
Doto sp. 2 (*Doto* sp. J)	VR	26, 50	20
Doto sp. 3	VR	26	20

Doto sp. 4	R	3, 26	20
Doto sp. 6	VR	50	20
Doto sp. 9	R	3, 12	20
Doto sp. 10	VR	33	20
Doto sp. 11	VR	40	20
Subordo Arminina Odhner, 1934			
Family Arminidae Pruvot-Fol, 1927			
Armina tigrina Rafinesque, 1814	VR	7	
Family Proctonotidae Gray, 1853			
Janolus cristatus (Delle Chiaie, 1841)	VC	3, 7, 17, 26, 29, 30, 40, 44, 48	
Subordo Aeolidiina Odhner, 1934			
Family Flabellinidae Bergh, 1889			
Flabellina affinis (Gmelin, 1791)	VC	1, 2, 8, 12, 13, 17, 20, 21, 26, 29, 30, 31, 32, 33, 36, 38, 40, 43, 44, 45, 48, 49, 50, 53, 55, 58, 59	
Flabellina ischitana Hirano & Thompson, 1990	VC	3, 8, 12, 29, 37, 40, 43, 44, 50, 53, 55, 58	
Flabellina babai Schmekel, 1972	C	3, 12, 20, 44, 50, 53, 55, 58	
Flabellina lineata (Lovén, 1846)	R	12, 13	
Flabellina pedata (Montagu, 1815)	VC	1, 8, 12, 26 28, 29, 30, 31, 33, 38, 40, 43, 44, 50, 53, 58	
Calmella cavolinii (Vérany, 1846)	VC	1, 8, 12, 29, 30, 38, 42, 43, 44, 50, 53, 57	
Family Piseinotecidae Edmunds, 1970			
Piseinotecus gabinierei (Vicente, 1975)	U	12, 23, 55	21
Family Facelinidae Bergh in Carus, 1889			
Facelina auriculcornis (Chamisso & Eysenhardt, 1821)	U	12, 13, 30	
Facelina bostoniensis (Couthouy, 1838)	C	17, 20, 30, 38	
Facelina fusca Schmekel, 1966	R	5, 30	
Facelina rubrovittata (Costa, 1866)	C	29, 30, 31	
Facelina quatrefagesi (Vayssiere, 1888)	C	1, 12, 17, 29, 30, 31, 44	22
Caloria elegans (Alder & Hancock, 1845)	C	6, 12, 23, 31, 44, 53	
Crateina peregrina (Gmelin, 1791)	VC	1, 3, 8, 12, 13, 17, 21, 26, 29, 30, 31, 32, 33, 38, 40, 43, 44, 45, 49, 50, 53, 55, 59	
Dicata odhneri Schmekel, 1967	R	17	23
Doudice banyulensis Portman & Sandmeier, 1960	C	12, 29, 44, 53	
Faceliinopsis marioni (Vayssiere, 1888)	R	30, 53	
Favorinus branchialis (Rathke, 1806)	VC	1, 17, 29, 40, 53	
Family Aeolidiidae D'Orbigny, 1834			
Aeolidiella alderi (Cocks, 1852)	C	1, 4, 5, 7, 19, 22, 24, 25, 30, 55	
Anteaeolidiella lurana (Marcus & Marcus, 1967)	VR	17	24
Berghia coerulescens (Laurillard, 1832)	VC	1, 5, 8, 29, 30	
Berghia verrucicornis (Costa, 1867)	R	17	
Limenandra nodosa Haefelfinger & Stamm, 1958	R	17, 29	
Cerberilla bernadettae Tardy, 1965	VR	12, 29	25
Spurilla neapolitana (Delle Chiaje, 1841)	VC	1, 3, 4, 6, 7, 15, 17, 24, 29, 30, 53	
Family Eubranchidae Odhner, 1934			
Eubranchus exiguus (Alder & Hancock, 1848)	U	26, 53	
Eubranchus farrani (Alder & Hancock, 1844)	U	12, 26, 40, 43, 50, 55	
Eubranchus tricolor Forbes, 1838	VR	30, 53	26
Family Calmidae Iredale & O'Donoghue, 1923			
Calma glaucoides (Alder & Hancock, 1854)	R	5, 30	
Family Tergipedidae Bergh, 1889			
Cuthona caerulea (Montagu, 1804)	C	12, 13, 21, 31	
Cuthona genovae (O'Donoghue, 1929)	C	26	
Cuthona ocellata (Schmekel, 1966)	R	5, 31, 55	
Family Fionidae Alder & Hancock, 1855			
Fiona pinnata (Eschscholtz, 1831)	VR	30	

Tab. 2. Abundance rank, localities, and eventual notes of each nudibranch recorded in the Tavolara Punta Coda Cavallo area (Northeastern Sardinia). Abundance is indicated as follows: VR = Very rare (only 1-2 specimens); R = Rare (3-10 specimens); U = Uncommon (11-30); C = Common (31-100); VC = Very common (more than 100).
The used nomenclature is mainly from Trainito & Doneddu (2014), with minor modifications.

Tab. 2. Abbondanza, località, ed eventuali note di ogni nudibranco ritrovato nell'area di Tavolara Punta Coda Cavallo (Sardegna nordorientale). L'abbondanza è indicata nel modo seguente: VR = Molto raro (soltanto 1-2 esemplari); R = Raro (3-10 esemplari); U = Non comune (11-30); C = Comune (31-100); VC = Molto comune (più di 100).
La nomenclatura utilizzata è tratta soprattutto da Trainito & Doneddu (2014), con piccole modifiche.





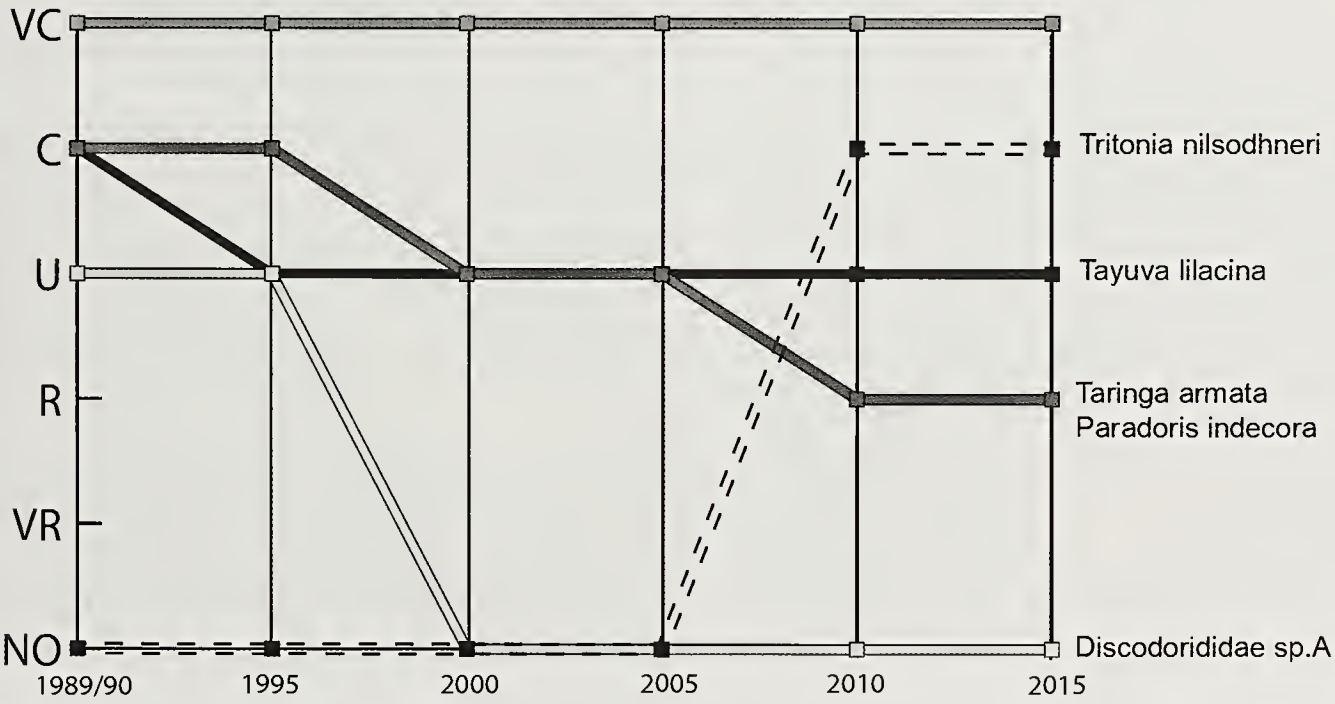


Fig. 2. Time trends in the abundance rank of species that showed significant variability. Abundance is indicate as follows: VR = Very rare (only 1-2 specimens); R = Rare (3-10 specimens); U = Uncommon; C = Common; VC = Very common.

Fig. 2. Andamento nel tempo dell'abbondanza delle specie che hanno mostrato una significativa variabilità. L'abbondanza è indicare come segue: VR = Molto rara (solo 1-2 esemplari); R = rara (3-10 esemplari); U = Non comune; C = comune; VC = Molto comune.

Taxonomic notes:

Family Onchidorididae Alder & Hancock, 1845

1. *Onchidoris* sp. (Fig. 3A)

On march 2015 in the Rada di Porto San Paolo, at 3 m depth in different dives, tens of individuals of a nudibranch of the family Onchidorididae were found. Their external morphology does not match with any other known species of Onchidorididae from the Mediterranean Sea, nor from the Atlantic Ocean: the main differences are on the texture and colour of the mantle and the dark colour of the gills. Some individuals were found spawning and many egg coils were found without evident connection with individuals. Two specimens have been collected and preserved. All the individuals were found near or feeding on the bryozoan *Reptadeonella violacea*, which is very common in the area under stones or exposed on rocky crops. A few days later individuals virtually identical to ours were reported from the eastern Atlantic Ocean, Achill Island, Co. Mayo, Ireland (Picton, 2015). In the website OPK-Opistobranquis (Ballesteros et al., 2015c) some findings of individuals are reported with photographs: they morphologically match with ours and with those from Achill Island. The individuals in OPK were identified as *Onchidoris pusilla*, but in our opinion, although some similarities may be observed, they do not correspond nor with the original description (Alder & Hancock, 1845), nor with further photographic records (Picton & Morrow, 1994); in particular *O. pusilla* main characters, according to Alder & Hancock (1845), are: "...cloak yellowish-white, thickly freckled with dark brown spots, and ... conical papillae obtusely pointed on the top... Branchial plumes ... beautifully white ...", while, with no variability, all the specimens here recorded have dark brown mantle freckled with white spots, hemispherical papillae and dark gills. It is possible that Sardinian, Irish and Catalan individuals must be a new species.

Family Polyceridae Alder & Hancock, 1845

2. *Polycerella emertoni* Verrill, 1880 **(Fig. 3B)**

This species, widely distributed along the western Atlantic coasts from Massachusetts to Brazil (Franz & Clark, 1972; Behrens & Gosliner, 1988), has been sporadically recorded in the eastern Atlantic (Edmunds, 1977; Schmekel & Portmann, 1982; Garcia & Bobo, 1986; Garcia-Gomez et al., 1991; Tamsouri et al., 2014) and in the Mediterranean, where it is reported from Campania (Schmekel, 1965), Tuscany (Cattaneo-Vietti et al., 1990), Malta (Sammut & Perrone, 1998), Greece (Koutsoubas et al., 2000) and Tunisia (Antit et al., 2011). On november 4 2013, we have found 2 individuals (one collected and preserved) at Lido Del Sole (Olbia), on *Zoobotryon verticillatus* inside a *Cymodocea nodosa* meadow at 3 m depth; this record should be considered as the first for Sardinia. Zenetos et al., (2004) consider *P. emertoni* an alien species whose introduction in the Mediterranean has taken course "probably on boat hulls"; the fact that Lido del Sole is located at the opening of the Olbia Gulf, a recognized hot spot for alien species (Doneddu, 2010b; Doneddu, 2011b), further confirms the hypothesis of an anthropogenic introduction.

Family Aegiridae Fischer, 1883

3. *Aegires palensis* Ortea Luque & Templado, 1990 **(Fig. 3C)**

One individual has been found on May 23 2015 in the Rada di Porto San Paolo on a rocky bottom crawling on *Palmophyllum crassum* at 3 m depth (collected and preserved). The species has been described on the basis of one single specimen found at Cabo de Palo, Spain (Ortea et al., 1990). Afterwards, a second individual was found at Aqua Amarga, Spain (Fahey & Gosliner 2004), a third one in locality L'Estagnol, along the French Mediterranean coast (Poddubetskaia Ossokine, 2009), a fourth one in Es Caials, Cadaqués, Spain (Ballesteros et al. 2015a) and a fifth record regards a specimen found during a survey in the Parc Natural de Cap de Creus (Catalunya, Spain) conducted on 20-21 June 2015 by GROC (Grup de Recerca d'Opistobranquis de Catalunya, 2015). The specimen here described is therefore on the whole the sixth record and the first for Italian seas.

Family Chromodorididae Bergh, 1891

4. *Felimida elegantula* (Philippi, 1844) **(Fig. 3D)**

Reports of this species, until now found in the central and eastern basins of the Mediterranean, are very few: Sicily (Philippi, 1844; Schmekel & Portmann, 1982), Southern France (Vayssière, 1913; Pruvot-Fol, 1958), Leghorn (Sordi, 1970), Santa Marinella (Trainito & Doneddu, 2014), Malta (Perrone, 1993), Cagliari and Turkey (Rudman, 2005) and Pantelleria (Picchetti, 2000). We found this species from 2006, with increasing frequency from 2010. In recent years it has become very common and widespread in many localities (see Tab. 2).

5. *Felimare gasconi* (Ortea, 1996) **(Fig. 3E)**

A specimen was found in locality Cala Coda Cavallo, May 1994, at 3 m depth under a stone on encrusting red algae (*Hildebrandia* sp.). Species rarely seen, it has been reported from Corse, Campania and Sicily (Ortea et al., 1996) and the French coast of Alpes Maritimes and Corse (Sittler & Müller, 2014). Not listed in the "Checlist della fauna dei mari italiani" (Cattaneo-Vietti & Giovine, 2008), although at that time it was already known from Campania and Sicily (biogeographic zone 3). The finding here reported is so far the only one from Sardinia.

Family Doridae **Rafinesque, 1815**

6. *Doris bertheloti* (D'Orbigny, 1839) **(Fig. 3F)**

Two specimens were found in locality Porto Legnaiuolo, in August 1994 and July 1996, both under stones, at 2 and 4 m depth (Doneddu, 2010), and a third individual in locality Isola di Reulino, in August 28 2011 under a stone at 9 m depth. This rare species in Mediterranean waters was recorded only from this area, from Venice lagoon (Perrone, 1989; Cesari, 1990) and Granada (Sánchez Tocino, 2002). From Atlantic it is known from Canary Island (Orbigny, 1839; Ortea & Bacallado,

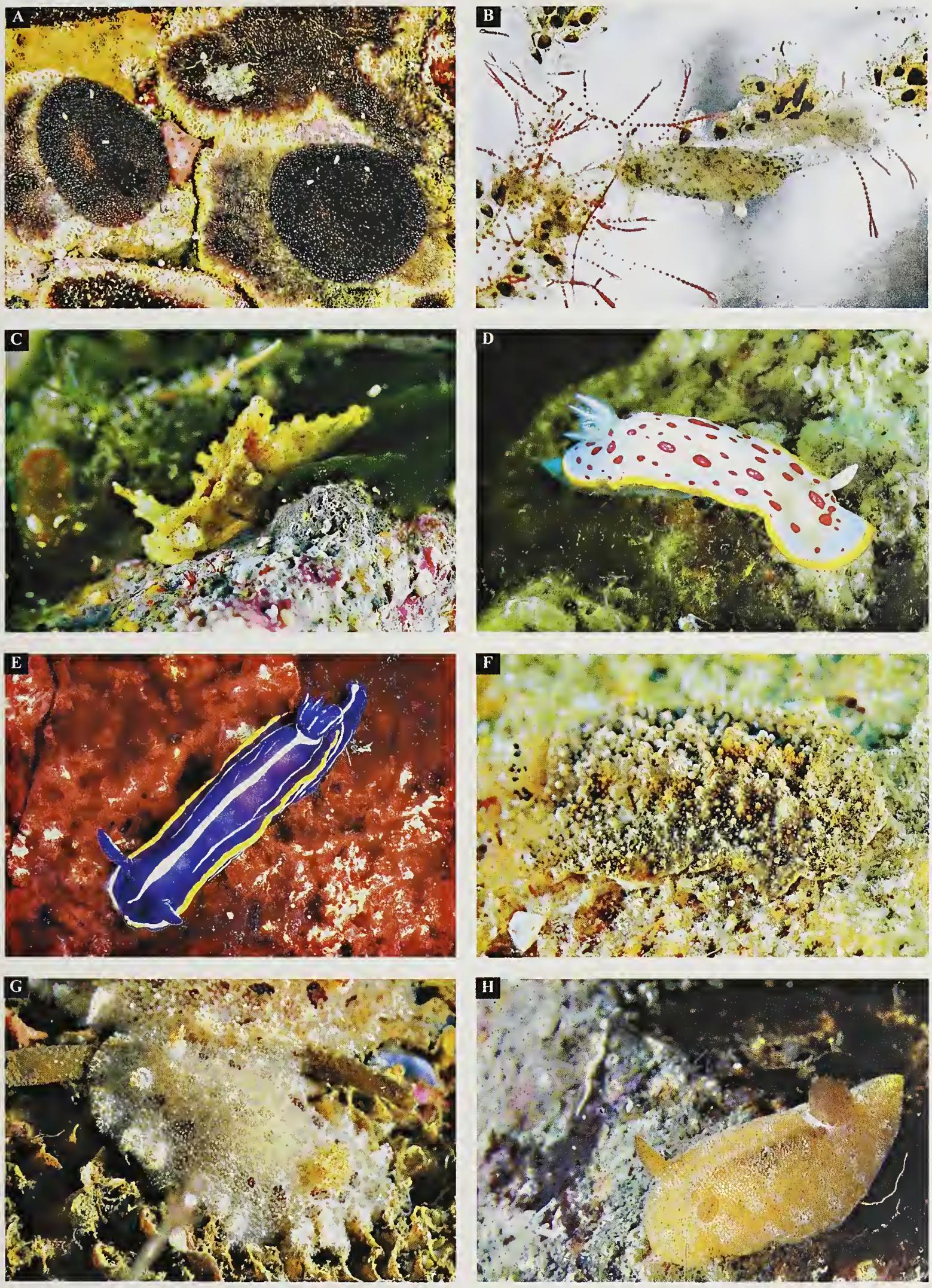


Fig. 3. A. *Onchidoris* sp. on *Reptadeonella violacea*. **B.** *Polycerella emertoni* on *Zoobotryon verticillatum*. **C.** *Aegires palensis*. **D.** *Felimida elegantula*. **E.** *Felimare gasconi*. **F.** *Doris bertheloti*. **G.** *Tayuva lilacina*. **H.** *Hoplodoris boucheti*.

Fig. 3. A. *Onchidoris* sp. su *Reptadeonella violacea*. **B.** *Polycerella emertoni* su *Zoobotryon verticillatum*. **C.** *Aegires palensis*. **D.** *Felimida elegantula*. **E.** *Felimare gasconi*. **F.** *Doris bertheloti*. **G.** *Tayuva lilacina*. **H.** *Hoplodoris boucheti*.

1981), Madeira (Wirtz, 1999) and Senegal ((Poddubetskaia Ossokine, 2003).

Family Discodorididae Bergh, 1891

7. *Tayuva lilacina* (Gould, 1852) **(Fig. 3G)**

We found this species in many locality of the studied area (see Tab. 2), with light and dark colour patterns. It appeared to be common in the years 1994-1997. In the "Check-list della fauna dei mari italiani" (Cattaneo-Vietti & Giovine, 2008), *Tayuva lilacina* is listed only for biogeographic zones 5 and 6; so this is the first report from Sardinia and zone 2.

8. *Hoplodoris boucheti* (Ortea, 1979) **(Fig. 3H)**

Rare species, recorded only few times: from Asturias (Ortea, 1979), from Catalonia, (Ballesteros & Ortea, 1981) from the area of the Strait of Gibraltar (Sanchez, 2002; Ballesteros et al., 2015a) and twice from the area studied in this work: at Cala Coda Cavallo as *Atagema* sp. (Cattaneo-Vietti et al., 1990), and at Porto Istana (Perrone & Doneddu, 1995). This species was previously attributed to the Genus *Carminodoris*, but this latter has been considered synonymous with *Hoplodoris* (Fahey & Gosliner, 2003); on this statement there is no unanimity, and some authors continue to use *Carminodoris* as valid genus.

9. *Taringa armata* Swennen, 1961 **(Fig. 4A)**

Periodically common in the studied area, it was found in localities 1, 4, 6, 17, 24, 30, under stones in very shallow water (0.5-1.5 meters). This population is the most consistent studied up to this time and the first permitting to observe the wide pattern variability: colour photo of several different patterned specimens are already available in literature (Doneddu, 2011). This population is the only one known for the biogeographic zone 2 of Italian seas (Cattaneo-Vietti & Giovine, 2008).

10. Discodorididae sp. A (Fig. 4B)

A first specimen was recorded from Cala Brandinchi (locality 23) and showed in colour photo (Cattaneo-Vietti et al., 1990) as *Aldisa* sp. In subsequent years, we found other more than 20 specimens in several locality of the studied area (see Tab. 2) from 1989 to December 1998. These specimens show some variability in colour, which can be more or less dark red, but for the remaining characters they are in appearance fairly constant, and undoubtedly they belong to the same species. Colour photos of some of these specimens were shown in Trainito (2005) as *Thordisa* sp. and in Trainito & Doneddu (2014) as "doride sardo". We have not been able to attribute these specimens to any Mediterranean or exotic known species: they probably represent a new species not yet described. We are not aware of other findings of this Discodorididae outside of those listed for the area subject of this study. The specimens range in size from 3 to 15 mm, and they were found under stones, cryptic on encrusting sponges (*Poecilosclerida*) in about 3-7 meters depth.

11. *Discodorididae sp. B* (Fig. 4C)

One single specimen of an unidentified Discodorididae was found in May 1998 under a stone at 3 m depth, near an egg coil, presumably laid by the same individual, which measured approximately 10 cm in length. It was not collected.

Family Tethyidae Alder & Hancock, 1855

12. *Melibe viridis* (Kelaart, 1858) **(Fig. 4 D)**

Found in Sardinia only since 2007 (Doneddu & Trainito, 2008), this alien species was reported from 2009 also in locality 5, 17, 29, 30, 41, where it became progressively more and more frequent. Currently it is commonly found mainly during autumn.

Family Dotidae Gray, 1853

13. *Doto acuta* Skhmekel & Kress, 1977 **(Fig. 4E)**

Rare species, cited in the literature from Naples (Schmekel & Kress, 1977) and Mazarrón (Marín & Ros 1990). It has been found several times in localities 1, 30, 40, 43, among hydrozoans. This record is the first for Sardinia and biogeographic zone 2 of Italian seas (Cattaneo-Vietti & Giovine, 2008).

14. *Doto cervicenigra* Ortea & Bouchet, 1989 **(Fig. 4F)**

It has been found several times in localities 12, 26, 40 and 50 on hydrozoans. The species has been described on one single specimen from Calvi, Corse (Ortea & Bouchet, 1989). It is known also from Catalonia (GROC, 2015B). This is the first record for the Italian seas.

15. *Doto caballa* Ortea, Moro & Bacallado, 2010 **(Fig. 4G)**

One specimen, whose external features match with the original description, was found at Molara Island (Punta Levante) on July, 2009. This species is known so far only from Ceuta and Albufeira (Ortea et al., 2010); this is therefore the first report from Italian waters.

16. *Doto koenneckeri* Lemche, 1976 **(Fig. 4H)**

One specimen was found on a *Posidonia* leaf on November 2012 at Punta Saline. Species widely distributed in Atlantic from Scotland to Spain (Picton & Morrow, 1994); in Mediterranean Sea it was reported from Spanish coast (Templado et al., 1988; Sánchez Tocino et al., 2000; Ortea et al., 2010), French coast (Poddubetskaia Ossokine, 2006b; Horst, 2010) and Ligurian coast (Betti et al., 2015). This is the first record from the Sardinian coast and biogeographic zone 2 of Italian seas.

17. *Doto paulinae* Trinchese, 1881 **(Fig. 5A)**

Two specimens were found on June 2009 in locality Secca del Papa on a mooring buoy. Rare species, known only from the western Mediterranean: Genoa (Trinchese, 1881), Villefranche (Haefelfinger, 1960), Naples (Schmekel, 1968), Mazarrón (Marín & Ros, 1991), Catalonia (Ballesteros, 1985), Port-Leucate (Poddubetskaia Ossokine, 2006). This one is the first report for Sardinia and biogeographic zone 2 of Italian seas.

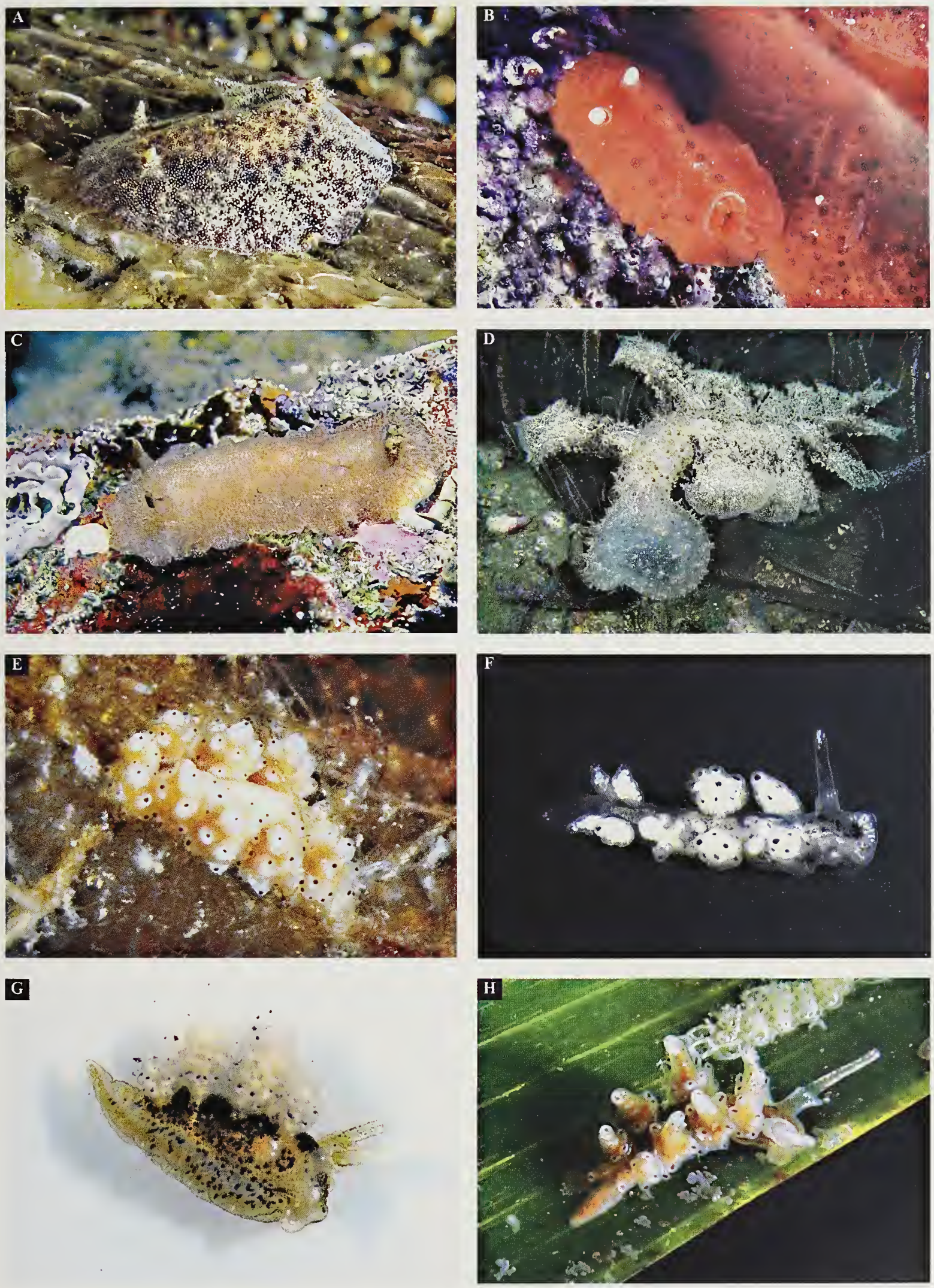


Fig. 4. A. *Taringa armata*. **B.** *Discodoridiidae* sp. A on *Poecilosclerida* sp. **C.** *Discodoridiidae* sp. B. **D.** *Melibe viridis*. **E.** *Doto acuta*. **F.** *cervicenigra*. **G.** *Doto caballa*. **H.** *Doto koenneckeri*.

Fig. 4. A. *Taringa armata*. **B.** *Discodoridiidae* sp. A su *Poecilosclerida* sp. **C.** *Discodoridiidae* sp. B. **D.** *Melibe viridis*. **E.** *Doto acuta*. **F.** *cervicenigra*. **G.** *Doto caballa*. **H.** *Doto koenneckeri*.

18. *Doto pontica* Swennen, 1961 (**Fig. 5B**)

A specimen, found at Tavolara Island on June 2009 in the dive site "Secca del Papa", shows a good correspondence with the original description. This species is reported in the Black Sea coasts of Turkey (Swennen, 1961), as well as along the Greek coasts (Koukouras, 2010). This should be the first record for the Italian seas.

19. *Doto rosea* Trinchese, 1881 (**Fig. 5C**)

Many individuals in reproductive activity were found in December 2014 on mooring buoys of the localities Secca d'Angelo e Secca della Mandria. One individual was found in May 2015 at Punta La Mandria. The species shows a considerable colour variability, probably depending on the diet. Although it is a widely distributed species in the Eastern Atlantic and the Mediterranean (Schmekel & Portmann, 1982; Cattaneo-Vietti et al., 1990), it is still rarely observed. For the Italian coast it is reported only for the biogeographical zones 1 (Trinchese, 1881) and 3 (Schmekel & Portmann, 1982). These findings are therefore the first to Sardinia and biogeographic zone 2.

20. *Doto* spp. (**Fig. 5D-H**) and (**Fig. 6A-B**)

In the study area we have found many individuals of *Doto* sp. whose external features do not match with any known species. Most of them have been found in peculiar conditions, i.e. on the mooring buoys, on the chains and on the lines of the dive sites operated by Tavolara MPA: on the submerged portion of these substrates many encrusting organisms find their ideal conditions and among them many different hydrozoans, on which *Doto* species (and other nudibranchs) feed, and conduct entire life cycles. Specimens from the localities Punta Arresto e Tavolara-Cala Cicale, collected in 2007 have been recently considered on a molecular basis a distinct species not yet described and named *Doto* sp. J (Pola & Gosliner, 2010; Pola & Gosliner, 2015; Shipman & Gosliner, 2015). In the last two cited papers, it has also been considered the indo-pacific affinity of this species. In **Fig. 5** and **6**, *Doto* sp. J and other unidentified *Doto* are shown: some of them could be assigned to an undescribed new species.

Family Piseinotecidae Edmunds, 1970

21. *Piseinotecus gabinierei* (Vicente, 1975) (**Fig. 6C**)

We found 5 specimens in 3 different localities (see Tab. 2), at a depth ranging from 4 to 8 m, on *Eudendrium*. Endemic species of the Mediterranean Sea, it was rarely observed. It is known for France in Provence (Vicente, 1975) and Corse (Cattaneo-Vietti et al., 1990), Turkey (Buyukbaykal, 2003), Croatia (Koehler, 2000), Spain (Cervera et al., 2004) and Greece (Poursanidis, 2011). From Italy it is reported in the biogeographic zones 1, 3 and 5 (Cattaneo-Vietti & Giovine, 2008), but there are also some findings in the zone 2 and in Western Sardinia (Koehler, 2015). Our records confirm the species for the biogeographical zone 2 and extend its presence in eastern Sardinia.

Family Facelinidae **Bergh in Carus, 1889**

22. *Facelina quatrefagesi* (Vayssiere, 1888) (**Fig. 6D**)

The species probably is less rare than what one can think on the basis of the very scarce findings registered in the past. Erroneously synonymized (Picton, 1979) with *Caloria elegans*, it can be easily distinguished for the lamellate rhinophores and for the long and irregularly disposed cerata. At present time, the species is common in the study area, found sometimes on *Halecium* sp., but its presence has never been recorded before 2010.

23. *Dicata odhneri* Schmekel, 1967 (**Fig. 6E**)

Species widely distributed in Eastern Atlantic and Western Mediterranean, although findings are rare. In Atlantic records exist for Ireland (Picton & Morrow, 1994), Canary Islands (Ortea Rato et al., 2008), Azores Islands and Portugal (Cervera e al., 2004); in Mediterranean it was reported from Andalucía and Catalonia (Cervera e al., 2004; Ballesteros, 2007) Gulf of Naples (Schmekel, 1967), Taranto (Ballesteros et al., 2015d). We found one specimen in locality Lido del Sole, at 6 m depth, on a dead *Posidonia* matte. This is the first record from Sardinia and biogeographical zone 2.

Family Aeolidiidae **D'Orbigny, 1834**

24. *Anteaeolidiella lurana* (Marcus & Marcus, 1967) (**Fig. 6F**)

Species native to the western Atlantic (Carmona et al., 2013), was also very rarely found in the Mediterranean, from Naples (Schmekel, 1968, as *Aeolidiella takanosimensis*), Malta (Sammut & Perrone, 1998), Cagliari (Koehler, 2015b). One specimen has been found (collected and preserved) in locality Lido del Sole on January 2015.

25. *Cerberilla bernadettae* Tardy, 1965 (**Fig. 6G**)

Rare species found only few times: along the French Atlantic coast (Tardy, 1965), Canary Islands (Moro et al., 1995), Tunisia (Ben Souissi, 2003), Provence and Corse (Daniel et al., 2014), Galicia and Andalucìa (Cervera et al., 2004). For the Italian coasts, there are some records not published in the literature, but documented by photos from Palinuro, Tuscany and Polignano a Mare (respectively Barbieri (2013), Guerrieri (2013), Colucci, De Bellis & Renieri (2014), personal communications). Two specimens were found in the studied area: the first one, on May 1989, in locality Isola Rossa, at a depth of 10 meters, under a stone (Cattaneo-Vietti et al., 1992). At the time, it was the second record ever, after the Tardy type series; photographic images of this specimen have already been shown (Cattaneo-Vietti et al., 1990; Trainito, 2005; Trainito & Doneddu, 2014). A second specimen was found 25 years later (December 2014), in locality Punta Saline on dead *Posidonia* matte at 6 m depth; this second specimen is shown in Fig. 6G.

Family Eubranchidae Odhner, 1934

26. *Eubranchus tricolor* Forbes, 1838 (**Fig. 6H**)

This species is widely distributed in the North Atlantic, both in American and European coasts (Picton & Mor-

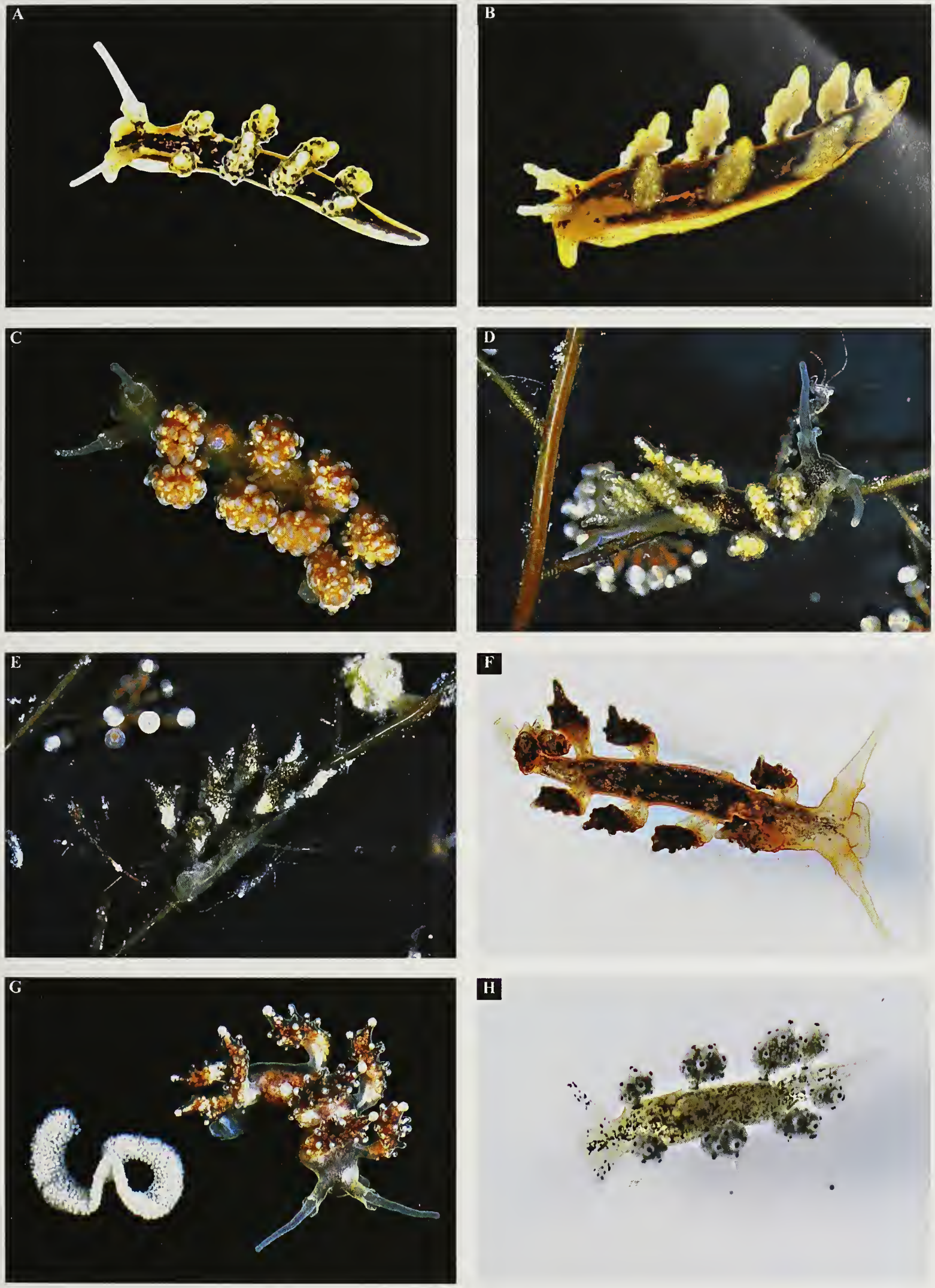


Fig. 5. A. *Doto paulinae*. **B.** *Doto pontica*. **C.** *Doto rosea*. **D.** *Doto* sp. 2 (sp. J). **E.** *Doto* sp. 3. **F.** *Doto* sp. 4. **G.** *Doto* sp. 6. **H.** *Doto* sp. 9.

Fig. 5. A. *Doto paulinae*. **B.** *Doto pontica*. **C.** *Doto rosea*. **D.** *Doto* sp. 2 (sp. J). **E.** *Doto* sp. 3. **F.** *Doto* sp. 4. **G.** *Doto* sp. 6. **H.** *Doto* sp. 9.

Fig. 6. A. *Doto* sp. 10. **B.** *Doto* sp. 11. **C.** *Piseinotechus gabinierei.* **D.** *Facelina quatrefagesi.* **E.** *Dicata odhneri.* **F.** *Anteaeolidiella lurana.* **G.** *Cerberilla bernadettae.* **H.** *Eubranchus tricolor.*

Fig. 6. A. *Doto* sp. 10. **B.** *Doto* sp. 11. **C.** *Piseinotechus gabinierei.* **D.** *Facelina quatrefagesi.* **E.** *Dicata odhneri.* **F.** *Anteaeolidiella lurana.* **G.** *Cerberilla bernadettae.* **H.** *Eubranchus tricolor.*

row, 1994), but it was rarely found in Mediterranean. It is reported from Ligurian Sea (Barletta & Melone, 1976), Adriatic Sea in Croatian and Italian coasts (Koehler, 2015c) and Provence (Koehler, 2015c). We found one specimen in locality Rada Porto San Paolo in 1995 and one in Tavolara Island (dive-site Occhio di Dio) on April 2014. Those are the first records for Sardinia and biogeographical zone 2.

Discussion

In all the species previously recorded are 15 whereas the present study lists 98 species out a total of 272 species known from the entire Mediterranean Sea. Among the 98 taxa recorded, 88 have been assigned to known species, while the remaining 10 had no correspondence with any known species from the Mediterranean (and apparently from any other location) and thus have been assigned at genus or family level. Specimens of one of these have been examined at molecular level and resulted as an autonomous entity, yet undescribed, called provisionally *Doto* sp. J and sister to a clade of short bodied indo-pacific species (Pola & Gosliner, 2010; Shipman & Gosliner, 2015). Very likely among the other 9 undetermined nudibranchs listed here there may be undescribed or new species for the Mediterranean.

The four suborders of Nudibranchia of the Mediterranean are represented: Doridina with 39 species (38,22%), Dendronotina with 24 species (23,52%), Arminina with 2 species (1,96%) and Aeolidina with 33 species (32,34%). Six species (*Aegires palensis, Felimare gasconi, Hoplodoris boucheti, Doto cervicenigra, Doto caballa, Doto pontica*) represent the first findings from the Italian waters.

Ten species (*Doris bertheloti, Tayuva lilacina, Taringa armata, Melibe viridis, Doto acuta, Doto paulinae, Doto rosea, Doto koenneckeri, Dicata odhneri, Eubranchus tricolor*) represent the first findings for biogeographical Zone 2 according to the "Checklist delle specie delle acque italiane" (Relini, 2008).

We must consider that the high frequency of frequentation by the authors of most of the sites in such a long period of time was the main reason for having found such a high number of species. However, we must also consider the influence of the heterogeneity of the marine environments and the good level of preservation of the natural habitats due to the protection status of almost the whole area: in fact, limitations to the exploitation of habitats and species (see MPA regulations http://www.amptavolara.com/fileadmin/amptavolara/documenti/decreti_e_regolamenti/regolamento_definitivo/Regolamento_AMP_Tavolara.pdf) and a long time cultural and educational effort displayed by the Tavolara Capo Coda Cavallo MPA have obtained significant and measured results in terms of reserve effect (Guidetti et al. 2014, Sala et al. 2012, Guidetti et al. 2010) and habitat preservation.

The high biodiversity resulting from this research further confirms that the sites here considered are worthy for environment protection.

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On the validity of *Mactra paulucci* Aradas & Benoit, 1872 with notes on the taxonomy of the genus (Bivalvia, Mactridae)

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Abstract
Mactra paulucci Aradas & Benoit, 1872 has been considered by most of the Authors a form or synonym of *M. stultorum* (Linné, 1758). Based on observations made on abundant material from various localities and the study of the type material, figured for the first time, *M. paulucci* is considered a valid species, distributed in Central and Eastern Mediterranean.

Key words
Mactra paulucci, *Mactra*, Mediterranean

Riassunto
[*Sulla validità di* Mactra paulucci *Aradas & Benoit, 1872 con note sulla tassonomia del genere* (*Bivalvia, Mactridae*)]. *Mactra paulucci* Aradas & Benoit, 1872 è stata considerata dalla maggioranza degli Autori una forma o sinonimo di *M. stultorum* (Linné, 1758). Sulla base dell'esame di materiale tipico e studio di abbondante materiale da varie località, *M. paulucci* è considerata specie valida, distribuita nel Mediterraneo centrale e orientale. Vengono descritti e discussi i caratteri morfologici del genere *Mactra* e le differenze tra le varie specie mediterranee. Viene evidenziato che le figure di *M. paulucci* e *M. targioni* sono state scambiate nel lavoro originale.

Parole chiave
Mactra paulucci, *Mactra*, Mediterraneo

Introduction

Mediterranean malacologists had often debated the real taxonomical consistence and interpretation of some nominal species of *Mactra*, i.e. *M. intermedia* Aradas, 1847, *M. paulucci* Aradas & Benoit, 1872, *M. targioni* Aradas & Benoit, 1872 and *M. lignaria* B.D.D., 1896. Authors often considered all these taxa as synonyms of the most common Mediterranean species *M. stultorum* (Linné, 1758). Some of them considered as valid the species *M. corallina* (L., 1768), otherwise considered the white form of the former. Lucas (1974) published a deepened contribute on the genus *Mactra* in Europe. He did not ignore the exam of soft parts, which however seem not to represent a good discriminating character without the support of genetic investigations. He finally concluded, without adding new informations and comparisons, the validity of only *M. stultorum* and referred to it all the remaining taxa, considered colour variations or morphological forms.
Recent checklists (CLEMAM, WoRMS), apart two alien species, report for the European waters only two species: *M. stultorum* and *M. glauca* Von Born, 1778.
The form and arrangement of the hinge teeth, the shell outline and convexity, the colour variability and the prodissoconch are here described in detail and utilized as good discriminating characters for the species recognition. Based on the result of combination of these characters and comparison of recently collected and type material, the oblivious taxon *M. paulucci* Aradas & Benoit, 1872 is here debated and morphologically distinguished from *M. stultorum* as a different, valid species.

Specific validity of *M. paulucci* could be inferred by the genetic investigations on two species of *Mactra* by Guarniero et al. (2010). The study reveals the existence of two different species in the studied area, but no shell figures are presented. Authors named these two species *M. corallina* (Linné, 1758) and *M. lignaria* Monterosato, 1878. As the material used as base for the study was collected in front of Cesenatico (northern Adriatic Sea), where are present only *M. paulucci* and *M. stultorum*, being the species named *M. lignaria* absent there, at our experience, it is easy to link the result of the study to the correct names, based on indicated biometric and colour characteristics.
A more detailed description of *M. paulucci*, on the basis of topotypic specimens and material from various localities, as well as an introduction guide to interpretation and use of taxonomical characters are here furnished.

Material and methods

This study was based on both living and dry shells collected by the Authors or other malacologists and housed in their private collections. Among observed materials the types of *M. paulucci* (MNHM) are included.
Stereo microscope allowed observations of morphological characters in adult as well as juveniles specimens:

dimensions, sculpture and colour of the shell were studied and compared. Important details were furnished by the hinge teeth form and arrangement.
Details of shell surface, teeth microsculpture and form of juveniles were obtained at the stereo microscope after coloration of shell surface with a colour constituted by silver proteinate 70% in Ag 1.0 g.
Details of live collected specimens of *M. paulucci* were observed to ascertain differences among species and their external soft parts recorded by means of colour drawings. In particular the colour and arrangement of both exhalant and inhalant siphons seem to be a species-specific character (**Fig. 4T**).
To allow a good interpretation of morphological characters, especially of teeth, here follows a brief description of these characters and the mode here utilized to correctly observe them (see sketches at **Fig. 3A-Q**).

General shell features

Shells belonging to the genus *Mactra* Linné, 1767 show a triangulate to ovate, inflated outline, with more or less rounded corners, equivalve, equilateral to slightly inequilateral.
Beaks are almost in the middle, with slightly tilted umbos. The general outline of the valves is depressed (**Fig. 3L**) in *M. glauca* and *M. paulucci*, inflated (**Fig. 3M**) in *M. stultorum*. The valves outline of juveniles may be different from fully mature specimens.
The hinge of the right valve (**Fig. 3A, N, O**) is composed by two separated cardinal teeth, plus two anterior (I, II) and two posterior (III, IV) laterals; anterior cardinal tooth (act) parallel (only immature specimens of *M. glauca*, **Fig. 3C**) or not parallel (mature *M. glauca*, *M. paulucci* and *M. stultorum*, **Fig. 3B**) with the hinge line.
Hinge of the left valve (**Fig. 3D, E, P, Q**) with three cardinal teeth: two are joined forming a reverse V-shaped projection (X, XI), while one (IX) is separated and weak (**Fig. 3D, E**); only one anterior and one posterior lateral tooth (VIII, VII) are present. The form and arrangement of the laterals could be different among different species. Here are proposed two different point of observation (PO1 and PO2, **Fig. 3A, F, G**) to distinguish the arrangement and position of laterals in different species.
In the left valve, anteriorly to cardinal teeth (**Fig. 3P**), a slit (cs, here named "cardinal slit") separates the anterior cardinal from the anterior lateral tooth: it could be very deep (*M. paulucci* and *M. stultorum*) or not deep (*M. glauca*). The external surface of valves is almost smooth as the internal margins. Colour of external surface is creamy white to brown, stripped by darker lines, despite entirely white colour is the normal for *M. stultorum* in some areas and rare for the other two species. We have not observed white specimens of *M. glauca*, although pictures of completely uncoloured specimens are not uncommonly present on the web. The colour of valve internal side ranges from whitish to partly or fully violet, depending on species. An external ligament (*tensilium*) is present as a thin layer over the hinge; the internal ligament (*resilium*) as a triangular formation inside the resilifer (**Fig. 3N-P, re**). These two ligaments are separated by a thin calcareous septum.
The hinge-line (**Figs. 3H, I, a**) is separated from the umbos by a wide zone (**Fig. 3I, b**) in *M. glauca* or by a narrow zone (**Fig. 3H, b**) in *M. paulucci* and *M. stultorum*.
The characteristics of the external soft parts are useful to distinguish the different species. In particular the colour and arrangement of both exhalant and inhalant siphons seems to be a species-specific character.
Internal muscle scars are almost similar among species, the pallial line is indented and presents a not particularly wide sinus.

Acronyms and abbreviations

Museo del Dipartimento di Biologia Animale dell'Università, Catania, Italy (MBAC); Museo Civico di Milano, Italy (MNHM); Aldo Brancato collection, Siracusa (ABS); Pasquale Micali collection, Fano (PMF); Danilo Scuderi collection, Catania (DSC); Gian Paolo Franzoni collection, Tortoreto Lido (GFT); Alberto Villari collection, Messina, (AVM); Paolo Crovato collection, Naples (PCN); sh = dry shell; live = live collected specimen; SEM = scanning electronic microscope. H: umbo-ventral diameter; L: antero-posterior diameter; W: latero-lateral diameter. For **Fig. 3A-Q**: anterior cardinal tooth (act), anterior lateral teeth (alt), resilifer (re), cardinal slit (cs), cardinal teeth (ct), distal from cardinal tooth (dis), left valve (LV), position 1 (PO1), position 2 (PO2), posterior lateral teeth (plt), proximal from cardinal tooth (prox), right valve (RV), marginal slit (s).

Systematics

Superfamilia Mactroidea Vaught, 1989
Familia Mactridae Lamarck, 1809
Subfamilia Mactrinae Vaught, 1989
Genus *Mactra* Linné, 1767

***Mactra paulucci* Aradas & Benoit, 1872**

Material examined

Fano (PU), over 100 live collected and several empty shells, fine sand bottoms, -2-5m (PMF); San Benedetto del Tronto (mid Adriatic sea), 4 sh., beach (PMF); Porto Cesareo (south Adriatic sea), 2 sh., beach (PCN); Plaja beach (Catania), 2 sh., beach (PMF) and 1 live and 5 valves (DSC); mouth of Anapo river (Siracusa): 3 sh., beach (AVM), 25 sh., 5 live and numerous valves (DSC), several teens sh. (ABS); Maganuco beach (Ragusa), 3 valves (DSC); Licata (south Sicily), 2 sh., beach (AVM); Gela (south Sicily), 9 sh., beach (AVM); Kerkennah island (southern Tunisia), 7 sh., beach (PMF); Port Fouad (Egypt), 9 sh. (**Fig. 4O**), beach (PMF, GFT).

Type material

Syntype (here selected) in MNHM (MSNM Mo 30353) (**Fig. 4A-D, G**): H = 38 mm, L = 44.8 mm, W = 20.8 mm.

Original description

Aradas & Benoit, 1872, p. 30, tav. I, fig. 2 (here **Fig. 4F**) (typo error for fig. 1, here **Fig. 4E**)
"Mactra testa subtransversa, trigona, depressa, subaequilatera, tenui, pallida, umbonibus prominulis, rubro-violacescentibus, radiis spadiceis evanescentibus picta, trasverse tenute striata; margine ventrali convexo; latere antico parum longiore, extremitate angulato-subrotundata; latere postico rotundato; area et lunula obtuse carinatis, ad summitatem tumidiusculis, inde planis, rectis et laevissimis; dentibus lateralibus crassis, atque robustis, mediis aliquantulum approximatis: fovea ligamenti sub-elongata [Shell sub-transverse, compressed, sub-equilateral, brittle, pale, beaks prominent, violet-red coloured and fawn, evanescent radiating rays, fine concentric lines; ventral margin convex,; anterior margin a little more extended, angled/sub-rounded; posterior margin rounded; escutcheon and lunule sub-keeled, a little convex above, than plain, straight and smooth; lateral teeth thick, strong, in the middle a little closer; resilifer sub-elongate]". The maximum dimensions indicated by the Authors are height 44 mm, length 52 mm, breadth 22 mm. Type locality is the harbour of Siracusa, where, at that time, it was so common to be sold for food. The species was dedicated to marchioness Paulucci, who collected this species at Siracusa (Sicily).

Redescription

Outline of valves: triangulate in shape in dorsal view, almost high as wide, posteriorly truncated, with rounded corners, dorso-ventral outline almost flattened and slightly rounded, with marked lunule delimited by a marked edge (text **Fig. 3O, Q**). Valves thin but solid, equivalve, equilateral; fine growth lines are present, but the surface is glossy. Periostracum brownish grey, presents over the shell surface around margins, anteriorly and posteriorly more conspicuous, not present on the central area of the valve and on the umbo.

Hinge: anterior cardinal teeth and cardinal slit as described above. Anterior and posterior lateral teeth of the right valve (**Fig. 1A-G**) are different in size: the internals are longer than externals, with long pointed end. Seen from aside, in position PO2, they appear almost at a right angle in respect to the margin of the shell (see figures above).
In the right valve (**Fig. 1A**) there are two anterior teeth (**Fig. 1B**): the internal one (**Fig. 1C**) is squared in outline and has a proximal region with a not-wide granulated area and a distal region sculptured by undulated, numerous, incised lines crossed by straight thin lines. The external one (**Fig. 1D**) is sculptured by straight thin lines only. In the posterior teeth (**Fig. 1E**) the internal one (**Fig. 1F**) is triangular and bears thin straight lines, followed by a wide posterior granulated zone, while the external one (**Fig. 1G**) has the same morphology of the other but is almost smooth.

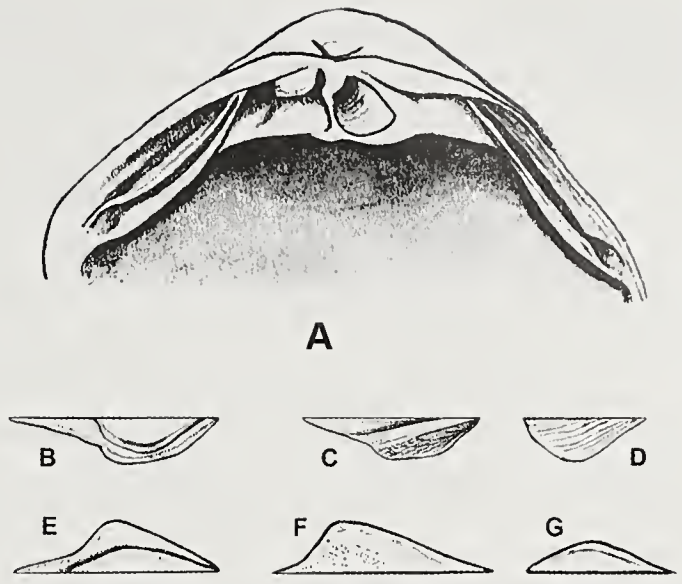

Fig. 1. A-G. *Mactra paulucci*, right valve**. A**. Hinge; **B**. Anterior teeth; **C**. Internal anterior tooth; **D**. External anterior tooth; **E**. Posterior teeth; **F**. Internal posterior tooth; **G**. External posterior tooth.

Fig. 1. A-G. *Mactra paulucci*, valva destra**. A**. Cerniera; **B**. Denti anteriori; **C**. Dente interno anteriore; **D**. Dente esterno anteriore; **E**. Denti posteriori; **F**. Dente interno posteriore; **G**. Dente esterno posteriore.

In the left valve (**Fig. 2A**) the anterior and the posterior lateral teeth are different in size and morphology, being not regularly triangular in shape. The anterior one (**Fig. 2B**) with few thin straight lines and a granulated area, which extend from the anterior to the posterior region; the posterior tooth (**Fig. 2C**) is almost rounded, without notch at the margin, and has a wide, thicker proximal pointed end, and a wide granulated, pointed, posterior end.

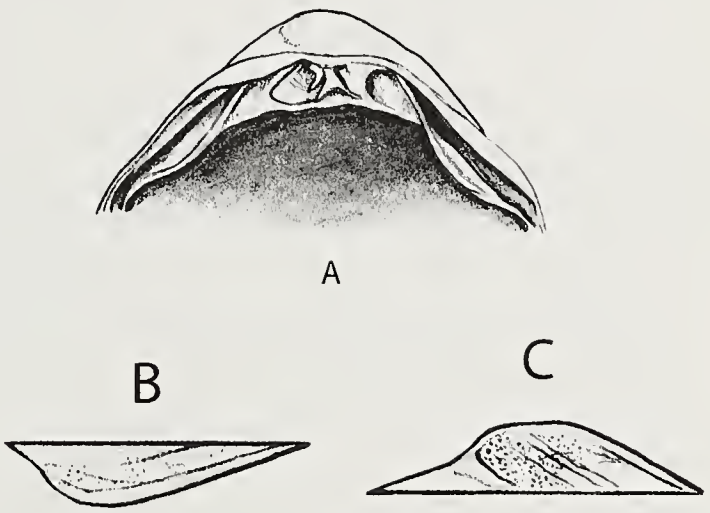

Fig. 2. A-C. ***Mactra paulucci***, left valve**. A**. Hinge; **B**. Anterior tooth; **C**. Posterior tooth.

Fig. 2. A-C. ***Mactra paulucci***, valva sinistra**. A**. Cerniera; **B**. Dente anteriore; **C**. Dente posteriore.

Edge of the hinge-line not very convex, only slightly undulated under the resilium area. The external margin of the hinge is high, separated from the umbo by a restricted zone; it forms an expansion, which slightly hide the umbo if seen in front of the hinge (**Fig. 3H, c**).

Colour: external of the valve whitish, with ochre radiating lines, more or less intense and irregularly spaced;

umbos darker, brown-violet; internal of the valve whitish, darker near the ventral margin, often with one or two darker concentric bands. Rarely fully white specimens.

Juveniles: ovate in outline, posteriorly wider, almost flattened, with a marked not centered umbo and concentric spiral lines, marked on anterior and posterior side, vanishing in the middle (**Fig. 4S**).

Dimensions: H = 30-37 mm, L = 35-41 mm.

External soft parts: yellowish in the adapical half, with a brown-grey stain over the foot corresponding to the stomach area; the abapical half and foot are almost white; siphons with light-yellow longitudinal strips and little black dashes at peripheral; tentacles at margin of the left siphon white with black central stain; the margins of the right siphon tentacles are alternated: one white, one black (**Fig. 4T**).

Variability

Adriatic specimens (**Fig. 4L, M, R**), as well as Sicilian specimens (**Fig. 4H, I, N, P, Q**) show a H/L ratio ranging from 0.78 to 0.91, with the ratio generally increasing with the size. There seems to be no difference between the H/L ratios of specimens from Adriatic Sea and Sicily. Specimens from Kerkennah islands, all having height lower than 30 mm, show a H/L ratio ranging from 0.74 to 0.85. Largest examined specimen from Fano measures: H = 45 mm, L = 52 mm, W = 23 mm, similar size is reached by specimens from Plaja beach (Catania).

Geographic distribution

Adriatic (abundant) to Ionian sea and Sicily Channel (localized populations). Based on studied material and reliable bibliographic references, this species seems to be distributed from Sicily Channel, Adriatic and Ionian Sea to extreme eastern Mediterranean; missing in the Tyrrhenian Sea and western Mediterranean.
It lives buried in intertidal and infralittoral silty/sandy bottoms. In Adriatic Sea it lives from just below the intertidal, in slightly muddy silt/sand, sympatric with *M. stultorum*.
Guarniero et al. (2010: 6) states that the effective reproductive isolation between the two species and/or sterility of hybrids "has still to be directly demonstrated, but obtained data are sound enough to support the species level for both morphs". This observation seems to be confirmed by the sympatric distribution of *M. paulucci* and *M. stultorum* at Fano, and the lack of any intermediate specimen over hundreds examined specimens from the mentioned localities.

Discussion

According to original description (Aradas & Benoit, op. cit.) *M. paulucci* differs from *M. stultorum* "per la forma quasi triangolare, per l'appianamento dei suoi lati dorsali, per la depressione delle sue valve e per la sua cerniera, avente denti laterali più larghi e molto robusti, i quali non sono in correspettivo della sottigliezza delle sue valve, e denti medii più ravvicinati tra loro [for the almost triangular profile, the straight dorsal margins, the depressed valves and the hinge, which have wider and stronger lateral teeth, contrasting with valve thickness, and closer middle teeth]. According to our observations the differences indicated by the Authors are confirmed, except the one relevant to "denti medii", because in the studied material the angle between cardinal teeth is about the same. In addition *M. paulucci* may be distinguished from *M. stultorum* also for the more elevated and pointed umbos, the deeper pallial sinus, the larger resilium, the anterior lateral teeth of right valve straight instead of bend toward the umbo and the posterior cardinal tooth on the left valve of about double length. As calculated by Guarniero et al. (2010), which named this species *M. corallina lignaria*, and verified in the studied material from Fano and other localities of the Adriatic coast, the mean value of H/L ratio is very similar, while W/H is about 0.53 against 0.64 and W/L is about 0.44 against 0.53.

To proceed in the discussion it is mandatory to highlight that the original descriptions of *M. targioni* and *M. paulucci* do not fit with the drawings, and it is clear that the drawings of the two species have been exchanged, therefore the species figured at fig. 1 is *M. paulucci*, while that at fig. 2 is *Mactra targionii*. This exchange is confirmed by the fact that the maximum dimensions of *M. paulucci* indicated by the Authors (H = 44 mm, L = 52 mm) correspond quite perfectly with the size of fig. 1 and with the largest specimen found at Fano (**Fig. 4R**). This error was not detected by the following Authors, thus both Locard (1890) and B.D.D. (1896) follow original drawings and erroneously interpret these two species. At present *M. targioni*, based on a single specimen is ignored by recent Authors. The only comment on this species is by Monterosato (1872: 25) who consider it synonym of *M. adansonii* Philippi, 1849. Today this species is named with the older name of *M. glabrata* Linné, 1767. It is distributed along the coasts of West Africa. The drawing and description of *M. targioni*, mainly the presence of grooves on both lunule and escutcheon, let suppose that Monterosato's opinion was correct.

B.D.D. (1896, sh. 558, pl. LXXXI, fig. 9, 10) consider *M paulucci* a variety "ex forma" of *M. corallina* and figure one specimen from Siracusa, corresponding as outline, not the colour, to fig. 2 of Aradas & Benoit and then following the wrong interpretation. Possibly the figured species is *M. stultorum*.
Monterosato (1917: 8) mentions the finding of this species at San Benedetto del Tronto (Mid Adriatic Sea).
Ruggieri (1949: 46), in a work on the marine mollusca collected on the beach of Fano (Mid Adriatic Sea), lists "*Mactra corallina aff. atlantica* B.D.D.", possibly because the specimen figured by B.D.D. (1896, pl. LXXXI, figg.

1-3) is also shown from the umbo and it is possible to view the depressed shape. *Mactra paulucci* differs from *M. corallina* var. *atlantica* B.D.D., 1896, that was described from Bretagne and never reported in Mediterranean, mainly for the triangular instead of transverse outline. Specimens having outline and dimensions corresponding to *M. corallina* var. *atlantica* have been found in Sicilian and Adriatic Sea localities and seems to be gerontic forms of *M. stultorum*.
Parenzan (1976: 355) considers the several described species/varieties all as forms/ecotypes of *M. corallina*.

A possible synonym of *M. paulucci* is *M. depressa* var. *opalina* Monterosato, 1917, where *M. depressa* Monterosato, 1917 is *nomen novum pro M. stultorum compressa* Puton, 1856 (*nomen nudum*). The taxonomic story is quite complex, because *Mactra stultorum* var. *compressa* was listed, but not described by Puton (1856: 222, n° 81) based on material from Syria, therefore it is *nomen nudum*. Monterosato (1917: 8, pl. 1, figg. 2, 3) describes for Gabés (Tunisia) a *M. compressa* var. *opalina*, stating that "Appartiene al gruppo di forme intese coi nomi di *corallina* e di *inflata* del Mediterraneo, ma è da questa diversa per la sua dimensione più piccola costante e per la sua forma compressa [It belongs to the group of forms assigned to *corallina* and *inflata* from Mediterranean, but it differs for the smaller size and the compressed form]" and "La *M. compressa* è piuttosto vicina alla *M. paulucci* [*M. compressa* is quite similar to *M. paulucci*]". In a Note at the end of the work, Monterosato (op. cit.: 27) propose to change the specific name in *depressa*, because already exists a *M. compressa* Pulteney, 1799. Therefore the first name accompanied by a valid description is *M. compressa* var. *opalina* Monterosato, 1917, which anyway is not valid because also *M. depressa* Lamarck, 1818 was already described at that time. The photos in Monterosato (1917, Pl. 1 fig. 2, 3) seems to represent an immature specimen of *M. paulucci*.
As immature specimens of *M. paulucci* are similar to juveniles of *M. glauca* (**Fig. 4U**), it is useful to describe the differences. According to original description (Aradas & Benoit, op. cit.) *M. paulucci* differs from *M. glauca* "per la conformazione della lunula e dell'area, per le strie trasversali che presentano le valve di quest'ultima specie, per la figura e per la cerniera della medesima [for shape of the lunule and escutcheon, for the concentric striae present on valves of the latter specie, for the profile and the hinge]". According to our observations it differs from *M. glauca*, which has a very similar hinge, for the more triangular and equilateral profile (H/L about 0.82 against 0.77 in specimen about 30 mm high). The lamellae of periostracum are more distant and regular, the maximum dimension is about the half (see also the Comparison Table).

Comparison table

Shell character	*M. paulucci*	*M. stultorum*	*M. glauca*
External colour	Whitish, with ochre radiating lines, umbos brown-violet. The radiating lines may be few and distant, or so crowded that represent the background. Rarely plain white.	Plain white or with ochre radiating lines and darker umbos. Therefore could be very similar to *M. paulucci*.	Beige with narrow, darker, radiating lines.
Internal colour	Whitish, often with one or two a little darker concentric bands parallel to ventral margin.	From fully white to violet, sometimes with violet bands parallel to ventral margin.	As the valve is thin, the same external colour is present inside.
Outline.	Broadly triangular, anterior side curved, posterior almost straight.	Broadly triangular, but with respect to *M. paulucci* the anterior side is more expanded and pointed.	Broadly oval with convex sides. Specimens having L= 30-40 mm have, with respect to *M. paulucci*, a lower H and oval instead of sub-triangular profile (H/L = 0.76-0.79). Compare **Fig. 4H, I** with **4U**
Dimensions	L max approx 54 mm	L max approx 65 mm	L max approx 110 mm
Periostracum	Brownish grey, presents over the shell surface around margins, anteriorly and posteriorly more conspicuous, not present on the central area of the valve and on the umbo.	Periostracum of the plain white specimens is greyish, present only around the margins. Darker coloured specimens have a brownish, more or less extended periostracum. Specimens from Gulf of Naples, have a dark brown periostracum, which arrives to cover the whole valve.	Yellow-brown, satinate, covering whole valve; with respect to *M. paulucci* the lamellae of periostracum are more distant.
Shell globosity (latero-lateral diameter, W)	Depressed: W/L < 0.5 and W/H < 0.6	Globose: W/L > 0.5 and W/H > 0.60	Depressed (W/H decreasing from 0.7 in immature specimen to 0.47 in medium/full grown, W/L decreasing from 0.55 to 0.35
Hinge	In the right valve the anterior lateral teeth are quite straight.	In the right valve the anterior lateral teeth bend toward the umbo.	

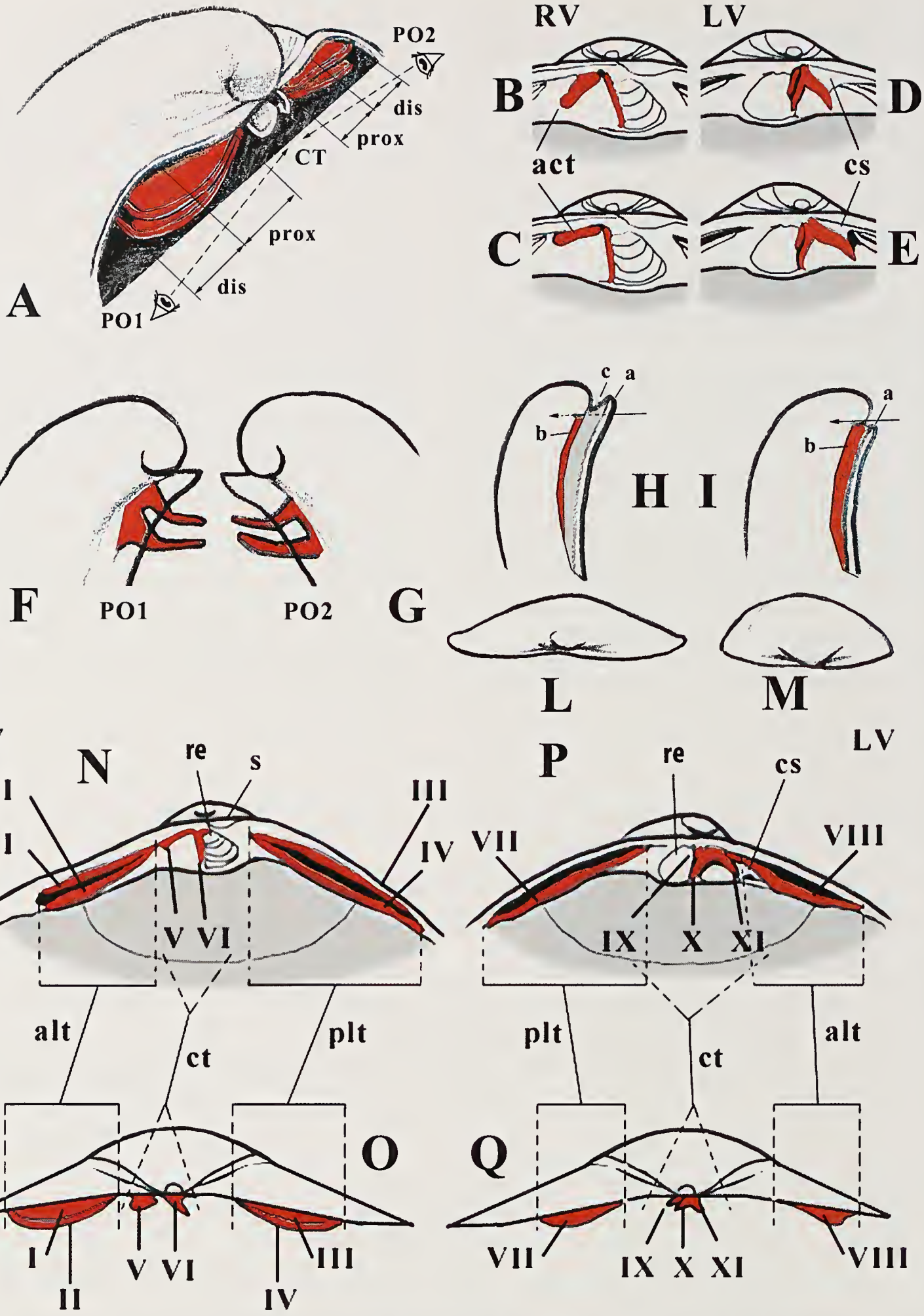

Fig. 3 A-Q. General features of valves and structures in shells of the genus *Mactra*. **A, F, G**. View of the hinge of *Mactra*, with indications of the two different point of view (PO1 and PO2) of lateral teeth; **B, D**. Cardinal teeth and cardinal sleet in valves of *M. stultorum* and *M. paulucci*; **C, E.** Cardinal teeth and cardinal slit in *M. glauca*"; **H, I**. Lateral view of valves of *Mactra*, displaying the external margin of the hinge (a), with a restricted or wide zone (b) depending on protruding (c) or not of the margin (the black arrow shows the opened or covered umbo seen from the hinge line); **L, M**. Flattened or inflated dorso-ventral outline of valves; **N, O.** Right valve profile, with teeth series; **P, Q.** Left valve profile, with teeth series.

Fig. 3 A-Q. Caratteristiche generali e strutture delle conchiglie del genere *Mactra*. **A**, **F**, **G**. Vista della cerniera di *Mactra*, con indicazione dei due diversi punti di vista (PO1 and PO2) dei denti laterali; **B**, **D**. Denti cardinali e solco cardinale nelle valve di *M. stultorum* e *M. paulucci*; **C**, **E**. Denti cardinali e solco cardinal in *M. glauca*; **H**, **I**. Vista laterale delle valve di *Mactra*, in cui si nota il margine esterno della cerniera (a), con una zona ristretta o ampia (b) dipendente dalla sporgenza (c) o non sporgenza del margine (la freccia mostra l'umbone scoperto o coperto visto dalla linea di cerniera); **L**, **M**. Profilo dorso-ventrale delle valve, appiattito o inflato; **N**, **O**. Profilo della valva destra, con dentatura; **P**, **Q**. Profilo della valva sinistra, con dentatura.

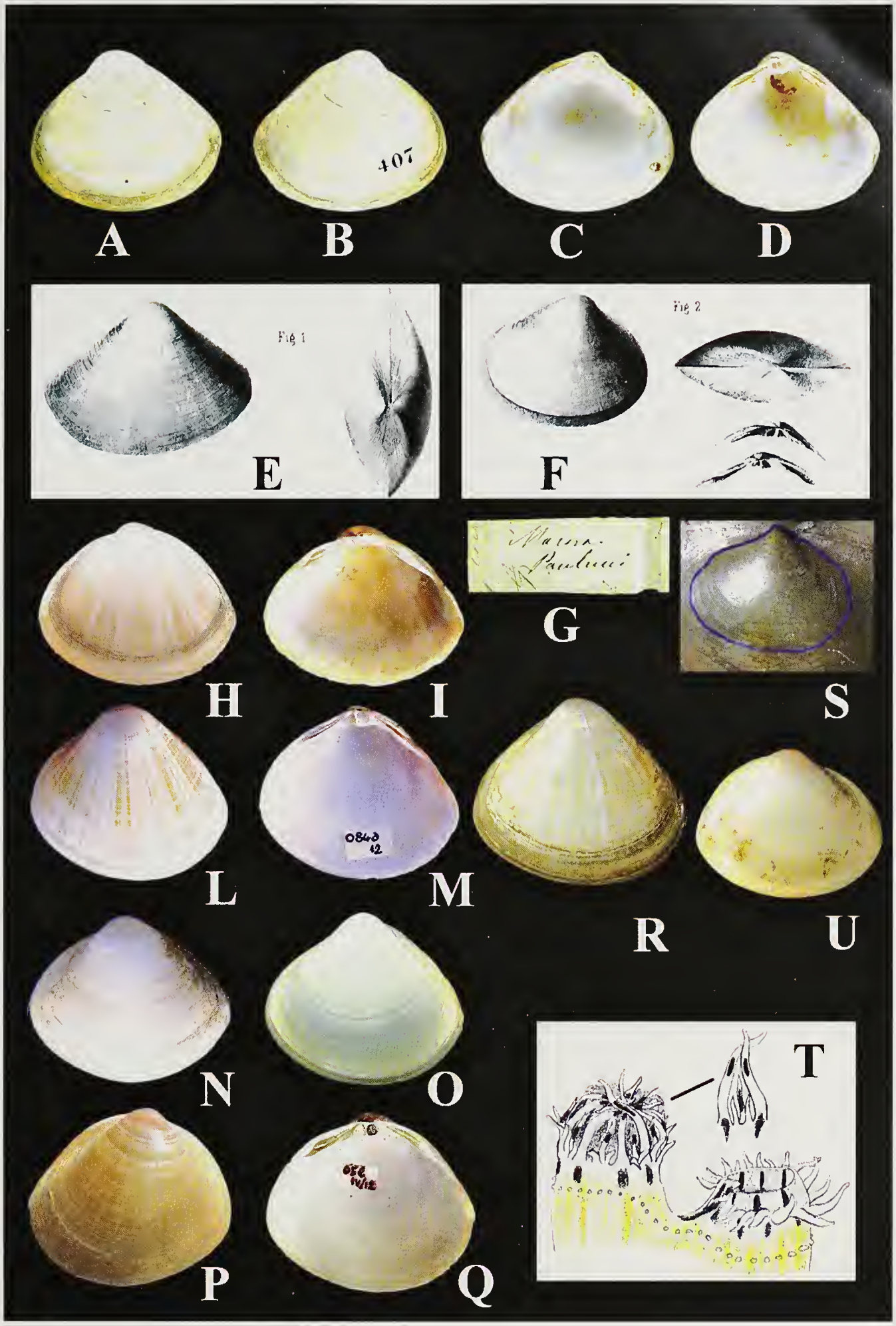

Fig. 4. A-T. *Mactra paulucci*. A-D. Syntype, MNHM (MSNM Mo 30353); **E.** Original drawing of *M. targioni*; **F.** Original drawing of *M.paulucci*; **G.** Original label, Aradas handwriting; **H, I, N**. Topotype specimens, Siracusa, Anapo river's estuary, typical colour (upward and downward view), H = 30 mm, and completely white specimen, H = 27 mm; **L, M, R**. Specimens from Fano, H = 36 mm (external and internal view) and 44 mm respectively; **O.** Port Fouad (Egypt), beach, H = 33 mm; **P, Q.** Right valve (external and internal view) from Maganuco, Ragusa, beach, H = 39 mm; **S.** Beak of the left valve of a specimen from Siracusa, magnified to show juvenile's form; **T.** Drawing of the external morphology of the soft parts of a specimen from Siracusa; **U.*M. glauca***, Kerkennah island (Tunisia), beach, H = 27 mm.

Fig. 4 A-T. *Mactra paulucci*. A-D. Sintipo, MNHM (MSNM Mo 30353); **E**. Disegno originale di *M. targioni*; **F**. Disegno originale di *M.paulucci*; **G**. Cartellino originale, manoscritto da Aradas; **H, I, N**. Esemplari topotipici dalla foce del fiume Anapo, Siracusa, colorazione tipica (vista esterna ed interna), H = 30 mm, ed esemplare completamente bianco, H = 27 mm; **L, M, R**. Esemplari da Fano, H = 36 mm (vista esterna ed interna) e 44 mm rispettivamente; **O**. Port Fouad (Egitto), spiaggia, H = 33 mm; **P, Q**. Valva destra (vista esterna ed interna) da Maganuco, Ragusa, spiaggia, H = 39 mm; **S**. Umbone della valva sinistra di un esemplare da Siracusa, ingrandita per mostrare lo stadio giovanile; **T**. Disegno della morfologia esterna delle parti molli di un esemplare da Siracusa. **U**. ***M. glauca***, isola Kerkennah (Tunisia), spiaggia, H = 27 mm.

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On the systematic position of *Murex syracusanus* Linnaeus, 1758 (Gastropoda, Fasciolariidae) with revaluation of the genus *Aptyxis*

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Abstract
The systematic position of Murex syracusanus Linnaeus, 1758, is reappraised. Existing historical records are analysed and the morphological characters are highlighted to differentiate it from Mediterranean congenerics, in particular, the structure of the last whorl of the teleoconch and the presence of tubercles delimiting the central part. Several radulas and the protoconch are illustrated and described. On the basis of these characteristics and comparison with Mediterranean and tropical congenerics, we propose reappraising the subgenus Aptyxis, raising it to the rank of Genus, in which to place Fusinus syracusanus Linnaeus, 1758. Fusinus luteopictus Dall, 1877, is also illustrated and on the basis of evident morphological characteristics that make it similar to F. syracusanus, we also propose to classify this species in Aptyxis.

Key words
Fasciolariidae, *Fusinus*, *Murex syracusanus*, *Aptyxis*, nomenclature.

Riassunto
[Sulla posizione sistematica di *Murex syracusanus* Linnaesu 1758 (Gastropoda, Fasciolariidae) con la rivalutazione del genere *Aptyxis*]. Si rivede la posizione sistematica di *Murex syracusanus* Linnaeus, 1758. Viene analizzata la bibliografia storica esistente e si evidenziano i caratteri morfologici che lo separano dai congenerici mediterranei. Si evidenzia in particolare l'andamento dell'ultimo giro di teleoconca e la presenza di tubercoli che ne delimitano la parte centrale, si illustrano e descrivono alcune radule e la protoconca. In base a queste caratteristiche ed a confronti con congenerici sia mediterranei che tropicali, si propone di rivalutare il sottogenere Aptyxis, elevarlo a Genere e qui collocare *Fusinus syracusanus* Linnaeus, 1758. Viene inoltre illustrato *Fusinus luteopictus* Dall, 1877 ed in base ad evidenti caratteristiche morfologiche che lo avvicinano a *F. syracusanus*, si propone di riportare anche questa specie in Aptyxis.

Parole chiave
Fasciolariidae, Fusinus, Murex syracusanus, Aptyxis, nomenclatura.

Introduction

Murex syracusanus Linnaeus, 1758 is an infralittoral species, relatively common and widespread along all the coasts of the Mediterranean Sea. Some authors also confirm its presence along the eastern Atlantic from Portugal (Barasch & Danin, 1988, 1992) to the Canary Islands (Lozet & Dejean-Arrecgros, 1977; Abbott & Dance, 1986; Poppe & Goto, 1991). With regard to its presence in the Canary Islands, recent studies (Hernàndez ed al., 2011) cite reports but indicate that it may be a case of misidentification. The species lives "sulle pietre a fior d'acqua" [on stones at the water surface] (Granata Grillo, 1877), on fine gravel, rocky substrates, muddy sand, infralittoral mud and bottoms rich in algal vegetation (Barasch & Danin, 1988), as well as in muddy sand biocoenoses of sheltered waters (Vio & De Min, 1996; De Min & Vio, 1997) and linked to photophilic algal and coralligenous biocoenoses (Campani, 1983). It is found with a certain frequency at depths from less than one metre (P. Russo, pers. obs.) down to 50 m (Campani, 1983).

Murex syracusanus (Linnaeus, 1758) is described as follows:

"M. testa oblonga, anfractibus striatis plicatis, tuberculoso carinatis, apertura edentula, cauda brevi. Testa anfractuum testis testaceis, parietibus vero albis."

In the words of Dodge (1957), author of the revision of the Linnean species, "The above description leaves much to be desired".

Buzzurro & Russo (2007) therefore provided a more detailed description: "Shell of medium size, opaque, robust but not heavy, fusiform, elongated and turriculate with 9 spiral whorls. Protoconch smooth, mammillated, composed of 1.25 whorls, ca. 516 µm in diameter, with small apical nucleus, 218 µm in diameter (Tav. 25, Fig. K). Axial ribbing dense and regularly spaced, 13-14 in number on the last whorl, convex, evident and uniformly milky white in colour on the first whorls of the spire. In the median part of the whorls, a keel divides the whorl in two halves; the adapical part forms a sharp angle with the keel up to the suture, which is clear and evident but not canaliculate; in this part of the whorl, the axial ribs are barely traced, obscuring the suture, whereas they are evident and prominent in the lower half of the whorl. The whorls bear 7-8 spiral cords alternating with rather evident intermediate cords. Simple, thick, internally striated lip. Corneous oval operculum. Siphonal canal straight, short and robust, slightly arcuate, open, reddish brown in colour. Aperture wide, sub-

oval, with columellar callus growing thicker towards siphonal canal. Columella without folds. Periostracum silky and persistent. Particular chromatic ornamentation on last whorl, consisting of irregular brown and white bands. Size up to 60 mm or more."
Here it is necessary to correct an imprecision in the description of the siphonal canal which is "slightly arcuate", not "straight and slightly arcuate".
F. syracusanus is a morphologically stable and easily recognised species, however there are variants with different colouring and structure, which it is well to indicate here:
specimens from the Aegean Sea have clear white and brown colouring with a particularly flared last whorl, short stout siphonal canal, wide aperture with characteristics very similar to those described above, and which we can regard as the typical form (Buzzurro & Russo, 2007) (**Fig. 1A**);
along the coasts of Apulia there is a particular form without the typical banded colouration, having a strong predominance of white, rounded whorls sometimes with less evident angulation of the whorls, smaller in size than the former, and living in white sandy environments (**Fig. 1B**);
in the lower Tyrrhenian Sea there lives a well characterised form with persistent dark brown periostracum, more slender whorls, less accentuated ribbing, slightly more elongated siphonal canal and medium-large dimensions for the species (**Fig. 1C**).

There are also five forms of *F. syracusanus*, the systematic position of which has not been completely clarified. Here we seek to clarify:
Fusus (Aptyxis) syracusanus (Linnaeus, 1758) var. *abbreviata* Coen, 1933 = *F. syracusanus*. The author writes that *"Fig. 77 suffices to describe the variant"*. Thus there is no description of the specimen. The figure shows beyond any shadow of doubt a specimen of *F. syracusanus* with a particularly short and stubby siphonal canal.
Aptysis [sic] *syracusanus* var. *fasciolarioides* Monterosato, 1884 = *F. syracusanus*. The author describes it very briefly as a "thick variety with prominent ribs". Settepassi (1983) illustrates two specimens in the Monterosato collection, one with the original label. One of the two has a slight malformation: anomalous whorl structure and a particularly deep suture.
Fusus (Aptyxis) syracusanus (Linnaeus, 1758) var. *rissoianus* Locard in Praus Franceschini, 1906 = *F. syracusanus*. Praus Franceschini (1906) and Settepassi (1985) consider this taxon a variety di *Fusus* (*Aptyxis*) *syracusanus*, whereas Worms (2004) considers it a synonym of *F. rostratus*. Locard's description, though not supported by any image, refers to 18-20 axial ribs, which excludes the possibility that the specimen is *F. rostratus*. We therefore agree with Praus Franceschini and Settepassi.
Fusus syracusanus (Linnaeus, 1758) var. *rubra* Scacchi, 1836 = *F. syracusanus*. The presence of specimens with a silky, uniformly reddish periostracum in the Aegean Sea and along the Tyrrhenian coasts of Campania does

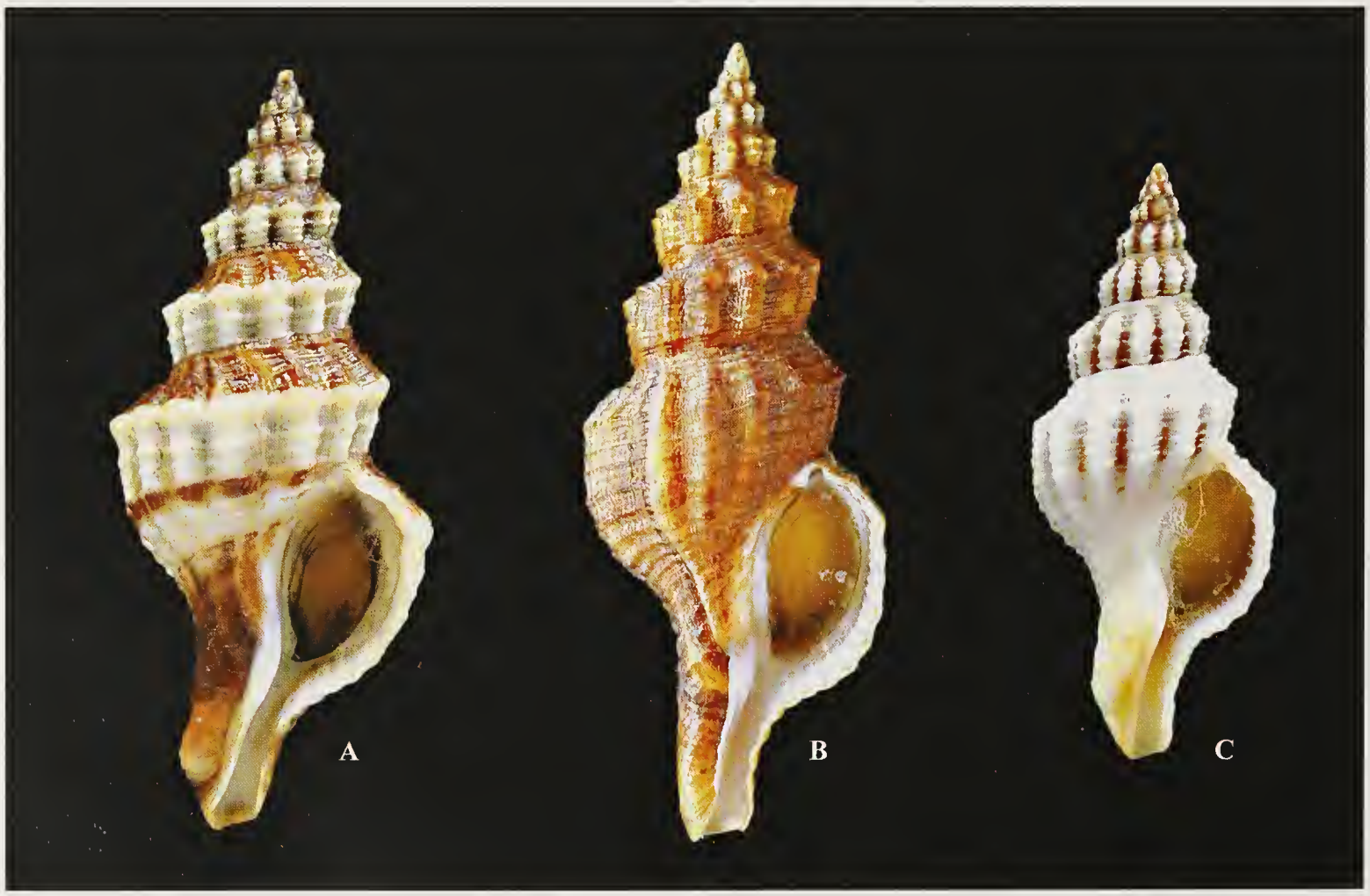

Fig. 1. **A**. *F. syracusanus* (Linnaeus, 1758), H=58.0 mm, Evia, Greece (CPR); **B**. *F. syracusanus* (Linnaeus, 1758), H=59.6 mm, Pozzuoli (NA) Italy (CPR); **C**. *F. syracusanus* (Linnaeus, 1758), H=36.4 mm, Nardò (LE) Italy (CPR)

Fig. 1. A. *F. syracusanus* (Linnaeus, 1758), H=58,0 mm, Evia, Grecia (CPR); **B**. *F. syracusanus* (Linnaeus, 1758), H=59,6 mm, Pozzuoli (NA) Italia (CPR); **C**. *F. syracusanus* (Linnaeus, 1758), H=36,4 mm, Nardò (LE) Italia (CPR)

not leave any doubt about the origin of the variety. See fig. 1B of the present paper.
Fusus (Aptyxis) syracusanus (Linnaeus, 1758) var. *umbilicata* Coen, 1922 = *F. syracusanus*. Neither the description nor the image leave any doubt that this is our species. The question of the umbilicus, noted by Coen, is highlighted in the present paper.
In Buzzurro & Russo (2007) the systemic collocation of this species is widely debated. Here it is further broadened and modified.

Discussion

The subgenus *Aptyxis* was established by Troschel in 1868 with the type species *Murex syracusanus* Linnaeus, 1758, of which he illustrates the radula. It is interesting to note what the author writes at the end of the description:
"Ich überlasse den Conchyliologen, denen eine reiche Sammlung zu Gebote steht, zu entscheiden, welche verwandte Arten mit Fusus syracusanus in dieses Subgenus übergehen müssen".
"I leave the decision of the subgenus in which to classify *Fusus syracusanus* to conchologists with rich collections."
Troschel considered *Aptyxis* to be a subgenus of *Latirus*, not of *Fusus*. Another author (Melville, 1891) includes it in *Latirus*, but on the question Snyder (2003) writes: "[erroneously] placed in *Latirus* by Melville, 1891b".
Cossmann (1901) explains that the genus *Fusus* was designated by Lamarck in 1799 and subsequently revised by him in 1801, when he eliminated certain species of *Pyrula, Fasciolaria, Turbinella* and *Pleurotoma* that Klein and Bruguière had confused. Cossmann goes on to say that the genus *Fusus* was later revised by Schumacher (1817), who designated *F. colus* (L.) as type species. According to Cossmann, Swainson (1840) separated *Liostoma, Strepsidura, Semifusus, Chrisodomus* and *Clarella* and designated *Fusus syracusanus* as neotype, the same species that Troschel later designated as type species of the genus *Aptyxis* due to certain aspects of the radula. However, Cossmann's was probably a misinterpretation, since in the paper by Swainson *Fusus syracusanus* is not designated as neotype of the genus, as he claims.
Cossmann (1901) makes many punctual logical considerations about this choice, but what counts is his closing sentence: *"or cette proposition repose exclusivement sur le choix du type de Fusus, et elle devient inutile dès l'instant qu'on choisit, à l'exemple de Fischer, le type désigné par Schumacher, c'est à dire F. colus"*.
Over the years, certain authors have considered the genus Aptyxis to be valid (Fischer P., 1884; Monterosato, 1884; Cossmann, 1901; Grabau, 1904; Pallary 1912a, 1912b, 1914, 1919a, 1919b; Moazzo, 1939; Snyder, 2003), while others have preferred to consider it a subgenus of Fusinus or Fusus (Monterosato, 1874; Granata Grillo, 1877; Bucquoy et. al., 1882; Pallary, 1900; Dall, 1921; Sacco, 1904; Praus Franceschini, 1906; Coen, 1922, 1933, 1937; Thiele, 1929; Coen & Vatova, 1932; Wenz, 1943; Parenzan, 1961; F. Nordsieck, 1968; Keen, 1971; Abbott, 1974; Franchini & Zanca, 1977; Oliver, 1980; Piani, 1980; Settepassi, 1985; Vaught, 1989; Sabelli et. al., 1990; Bodon et. al., 1995; Millard, 1977; Cevik & Sarihan, 2004; Mallard & Robin, 2005). Bouchet & Waren (1985) tentatively place F. syracusanus in the genus Aptyxis sustaining that it could also be considered a subgenus. Others consider Fusinus the most appropriate taxon for M. syracusanus (Ghisotti 1972, Parenzan 1977, Bandel 1977, Abbott & Dance 1986, Barasch & Danin 1992, Arduino et al. 1995, Orr 2000, Costello et al. 2001, Giannuzzi-Savelli et al. 2003, Repetto et al. 2005).
Among the authors cited, Dall established Aptyxis luteopicta (Fig. 2A) from Monterey, California, in 1921. This species is well illustrated in Tucker & Abbot (1954) (**Fig. 2B**) and is still a valid species, but belongs to Fusinus (WoRMS). Many similarities with F. syracusanus are evident, such as whorl structure, division of the last whorl of the teleoconch into three portions, siphonal canal conformation, the trace of a false umbilicus and a certain degree of intraspecies variability. Tryon (1881) illustrates it too and the same conclusions can be drawn (**Fig 2**). The geographical distance between these two species (Mediterranean Sea and Bay of California) is certainly puzzling and may possibly be explained by the fact that in the Eocene there were geographical and faunal propinquities and the Tethys Ocean stretched from New Zealand through the Mediterranean to the two Americas, which only joined in the Miocene. In an epoch very close to the Eocene, the Mediterranean Sea separated from the Indopacific. Further studies will endeavour to clarify this phenomenon, first of all by analysing genera or species present in this geographic interval which could have morphological affinities with *Aptyxis*.
Clearly, the question has always been controversial, but morphological comparison with other congeneric species has never been conducted in a sufficiently meticulous way.
Indeed, from the morphological viewpoint and ignoring the general typically fusiform appearance of the shell, certain features that distinguish it from other representatives of the genus must be examined with care. Measurement of a number of protoconchs gave conflicting results, as in other species of the genus *Fusinus*: in some cases it was by far the smallest of the genus, reaching 516 µm with a nucleus of 218 µm (**Fig. 3A**); in other cases SEM showed protoconches with a diameter of 845 µm and a nucleus of 340 µm for specimens from the Aegean Sea (**Fig. 3B**). Recent studies (Russo, 2014) showed that protoconch measurements are of relative value in the genus Fusinus: for example, the protoconch of F. rostratus (Olivi, 1794) in its various phenotypes shows extreme variability, with measurements from 664 µm to 907 µm and nuclei from 321 µm to 521 µm, again too wide a range to use as factors for distinguishing species (Russo, 2013; Russo & Germanà, 2014, Russo, 2014).
In observing whorl structure, one also notices a feature

Fig. 2. **A**. *F. luteopictus* (Dall, 1877), H=27.0 mm, Island of Santa Cruz, California (CPR), **B**. *F. luteopictus* (Dall, 1877), H=14.5 mm, California (CPR); **C.** *F. syracusanus* (Linnaeus, 1758), H=12.8 mm, Island of Limnos, Greece (CPR).

Fig. 2. **A**. *F. luteopictus* (Dall, 1877), H=27,0 mm, Isola di Santa Cruz, California (CPR); **B**. *F. luteopictus* (Dall, 1877), H=14,5 mm, California (CPR); **C.** *F. syracusanus* (Linnaeus, 1758), H=12,8 mm, Isola di Limnos, Grecia (CPR).

which is almost unique to Mediterranean species of the genus *Fusinus*: the whorls of the teleoconch are clearly divided in two in the horizontal plane, but the whole last whorl seems clearly divided into three portions: the abapical part consisting of the concave part after the siphonal canal (this portion terminates with a series of small low protuberances, from which the series of ribs begins: these are separate, dense, axial ribs with high relief, 13 or 14 in number, that form the second part of the whorl. The ribs end with another series of tubercles from which the third part of the whorl begins: this is strongly angled and it ribs have much less relief (**Fig. 4**); often they are not even visible. In Mediterranean species of Fusinus, such clear and evident separation is only found in the present species and in Fusinus profetai Nofroni, 1982 (**Fig. 5**), whereas it is found in a certain number of species of the genera Latirus and Peristernia, and it is absent or difficult to discern in tropical species of Fusinus. When F. profetai was described, the author weighed the pros and cons of assigning it to Latirus, but since he did not consider its characteristics sufficient, he opted for assigning it to Fusinus. The hypothesis had some foundations and indeed the species was later moved to Latirus (Sabelli et al. 1990), but this action was not followed up and no explanatory note apart from the brief one in the Check List was ever published. The lack of tubercles at the base and summit of the axial ribs, and their smaller number with respect to *M. syracusanus*, do not provide sufficient support for moving *F. profetai* to another genus.

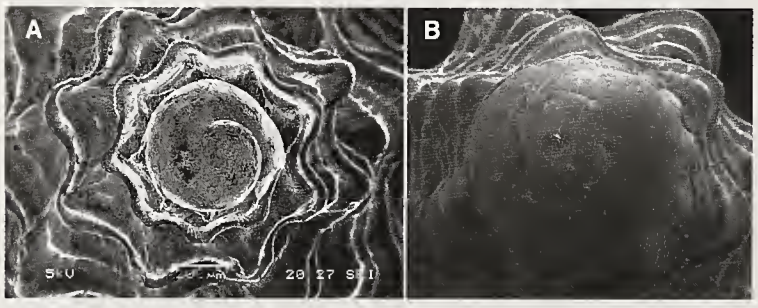

Fig. 3. **A**. *F. syracusanus* (Linnaeus, 1758), coast of Apulia, top view of protoconch, 516 µm, nucleus 218 µm; **B.** *F. syracusanus* (Linnaeus, 1758), Aegean Sea, 845 µm, nucleus 340 µm.

Fig. 3. **A**. *F. syracusanus* (Linnaeus, 1758), Coste della Puglia, vista dall'alto della protoconca, 516 µm, nucleo 218 µm; **B.** *F. syracusanus* (Linnaeus, 1758), Mare Egeo, 845 µm, nucleo 340 µm.

Vermeij and Snyder (2006) give a very similar description and extend it to other members of the Family Fasciolariidae such as *Latirus*, *Hemipolygona*, *Turrilatirus* and *Polygona*. This description is considered to have little pertinence to *Turrilatirus* and *Polygona*, but to be perfectly appropriate for *Latirus* and *Hemipolygona*, and here, we add, to *Aptyxis*, while it is irrelevant to *Fusinus* which has rounded whorls, ribs generally with low re-

Fig. 4. **A**. *F. syracusanus* (Linnaeus, 1758), last whorl of spire with clear division into three sections.

Fig. 4. **A**. *F. syracusanus* (Linnaeus, 1758), ultimo giro della spira con evidente divisione in tre sezioni.

lief and separations in the horizontal plane, which are unclear or non existent, as for example in *F. colus* (Linnaeus, 1758), *F. ocelliferus (Lamarck, 1816, F. dilectus* (A. Adams, 1856) and *F. australis* (Quoy & Gaimard, 1833) (**Fig. 6**).

The radula is rather variable intraspecifically, always 1-R-1, and shows the following features:

In the first radula examined (**Fig. 7A**) the mesocone of the rachidian tooth is much longer than the ectocones and the first cusp of the lateral tooth is double; in the second (**Fig. 7B**) the mesocone of the rachidian tooth is the same height as the ectocones; in the third (**Fig. 7C**) we observe cusps of the lateral teeth that are much longer and finer than the previous teeth. Bouchet & Warén (1985) postulated the (sub)genus Aptyxis on the basis of radula conformation.

Another characteristic separating *F. syracusanus* from the other species of the genus is the presence, albeit not constant, of a trace of false umbilicus. This feature is found in large specimens from the Aegean Sea. No other species of *Fusinus* in the Mediterranean Sea have this characteristic (**Fig. 8**).

Fig. 5. **A.** *F. profetai* Nofroni, 1982, 11.5 mm, Island of Kàrpathos, Greece (CPR).

Fig. 5. **A.** *F. profetai* Nofroni, 1982, 11,5 mm, Isola di Kàrpathos, Grecia (CPR).

Conclusions

With these premises, we propose revision of the systematic postion of *M. syracusanus*. Certain morphological characteristics make it similar to the genus *Latirus*, but here we prefer to comply with Vermeij & Snyder (2006) who limited *Latirus* to the Indo-Pacific area, so that assigning it to this genus would be problematical. Moreover, study of the many available specimens of *Latirus* shows that the genus normally has an extra three-quarters of a whorl of protoconch than *M. syracusanus*.

The taxon *Aptyxis* seems available and has long been used by various authors, albeit by some as a subgenus. It therefore seems more expedient and correct from a nomenclatural viewpoint, and in line with Bouchet & Waren (1985), to revise the subgenus *Aptyxis*, raising it to Genus, in which to place *Fusinus syracusanus* (Linnaeus, 1758) and *Fusinus luteopictus* Dall, 1877, the new systematics of which becomes:

Fig. 6. **A**. *F. colus* (Linnaeus, 1758), 132 mm, Madras, India (CPR); **B**. *F. ocelliferus* (Lamarck, 1816), 132.4 mm, Agulhas Bank, South Africa (CPR); **C**. *F. dilectus* (A. Adams, 1856), 103 mm, Island of Margarita, Venezuela (CPR); **D**. *F. australis* (Quoy & Gaimard, 1833), 96 mm, Adelaide, Australia (CPR)

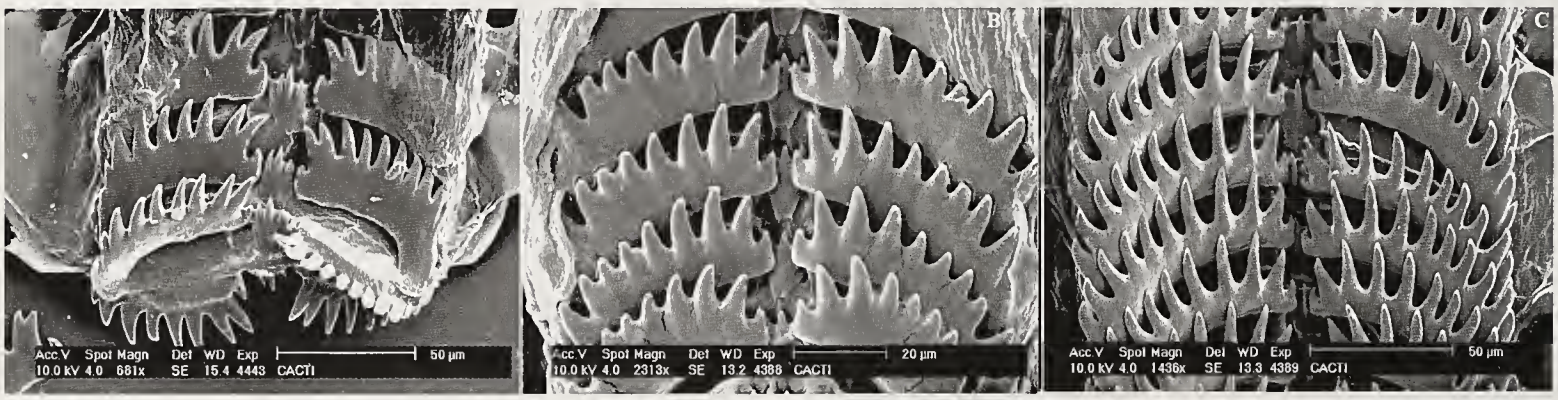
A
Acc.V Spot Magn Det WD Exp 50 µm
10.0 kV 4.0 681x SE 15.4 4443 CACTI
B
Acc.V Spot Magn Det WD Exp 20 µm
10.0 kV 4.0 2313x SE 13.2 4388 CACTI
C
Acc.V Spot Magn Det WD Exp 50 µm
10.0 kV 4.0 1436x SE 13.3 4389 CACTI

Fig. 7. **A.B.C.** *F. syracusanus*, radulas.

Fig. 7. **A.B.C.** *F. syracusanus*, radula.

Family Fasciolariidae J.E. Gray, 1853
Subfamily Fusininae Wrigley, 1927
Genus *Aptyxis* (Troschel, 1868)
Aptyxis syracusanus (Linnaeus, 1758)
Aptyxis luteopictus Dall, 1877

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Fig. 8. *F. syracusanus*, false umbilicus.

Fig. 8. *F. syracusanus*, falso ombelico.

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First record of *Pollia assimilis* (Reeve, 1846) (Gastropoda: Buccinidae) from Italy

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Abstract
We first report the presence of *Pollia assimilis* (Reeve, 1846) from Italy (southern Sardinia). Present sightings widen the known distribution of this species, only known from the Atlantic Ocean (from Senegal to Morocco) and the Mediterranean coast of Spain. Finally, we provide comparative diagnostic features for all the species of the genus *Pollia* Gray, 1834 recorded from the Mediterranean Sea.

Key word
Pollia assimilis, Buccinidae, Mollusca, Italy, Sardinia.

Riassunto
[Primo ritrovamento di *Pollia assimilis* (Reeve, 1846) (Gastropoda: Buccinidae) in Italia]. Riportiamo per la prima volta la presenza di Pollia assimilis (Reeve, 1846) in Italia (Sardegna meridionale). I presenti rinvenimenti ampliano l'areale di distribuzione di questa specie, precedentemente conosciuta solo dall'Oceano Atlantico (dal Senegal al Marocco) e dalla costa mediterranea spagnola. Infine, riportiamo i caratteri diagnostici noti per tutte le specie del genere *Pollia* Gray, 1834 segnalate per il Mar Mediterraneo.

Parole chiave
Pollia assimilis, Buccinidae, Mollusca, Italia, Sardegna.

Five species belonging to the genus *Pollia* Gray, 1834 have been recorded from the Mediterranean Sea. Three of them, *Pollia dorbignyi* (Payraudeau, 1826), *Pollia scabra* (Locard, 1886) and *Pollia scacchiana* (Philippi, 1844), are known from centuries as Mediterranean inhabitants. Among the remaining taxa, *Pollia campisii* Ardovini, 2015 is a newly described species, so far known from south-eastern Sicily deep waters (90-100 m) only (Ardovini, 2015). Finally, *Pollia assimilis* (Reeve, 1846) is an eastern Atlantic species occurring from Senegal to Morocco and Canary Islands (Ardovini & Cossignani, 2004; Poppe & Goto, 1991), only recorded from the Mediterranean basin by a single specimen from the Ebro Delta (eastern Spain) (López Soriano & Quiñonero Salgado, 2014).

During field researches held in February-March 2015, few empty shells of a highly distinctive medium-sized buccinid species were found in association with *Mytilus galloprovincialis* Lamarck, 1819 in the harbor of Su Siccu, Cagliari (Italy) (39°12'15.9"N, 9°07'16.0"E). Subsequent researches performed in the same area led to the discovery of living specimens (**Fig. 1**) amidst shallow water mussel beds, in association with *Ocinebrina edwardsii* (Payraudeau, 1826) and *Ocenebra erinaceus erinaceus* (Linnaeus, 1758). Ten living specimens were immediately preserved in 90% ethanol for genetic study. Morphological features matched those of *P. assimilis* (see below), therefore offering us the possibility to enlarge its published distribution.

P. assimilis (**Fig. 2. A-R**), in fact, differs from *P. dorbignyi* (**Fig. 2. S-X**) in having a higher number of spiral cords, with primary cords of the same strength and absence of the subsutural cord present in *P. dorbignyi* (**Fig. 2. R, X**). The two taxa further differ in protoconch features (*P. assimilis*: higher and consisting of 1.75 whorls *vs P. dorbignyi*: more dome-shaped and of 1.25 whorls) (**Fig. 2. P-Q, V-W**). Finally, although both species have a very similar color pattern, *P. dorbignyi* usually shows a higher chromatic variability.

P. assimilis has a spiral sculpture similar to *P. scacchiana* (**Fig. 3. A-F**), but it can be easily separated by that taxon in being quite larger (*P. assimilis*: average height 17.5 mm *vs P. scacchiana*: average height 10.8 mm). Protoconchs of the two species are also very similar in shape,

Fig. 1. *Pollia assimilis* (Reeve, 1846), living specimen in aquarium.

Fig. 1. *Pollia assimilis* (Reeve, 1846), esemplare vivente in acquario.

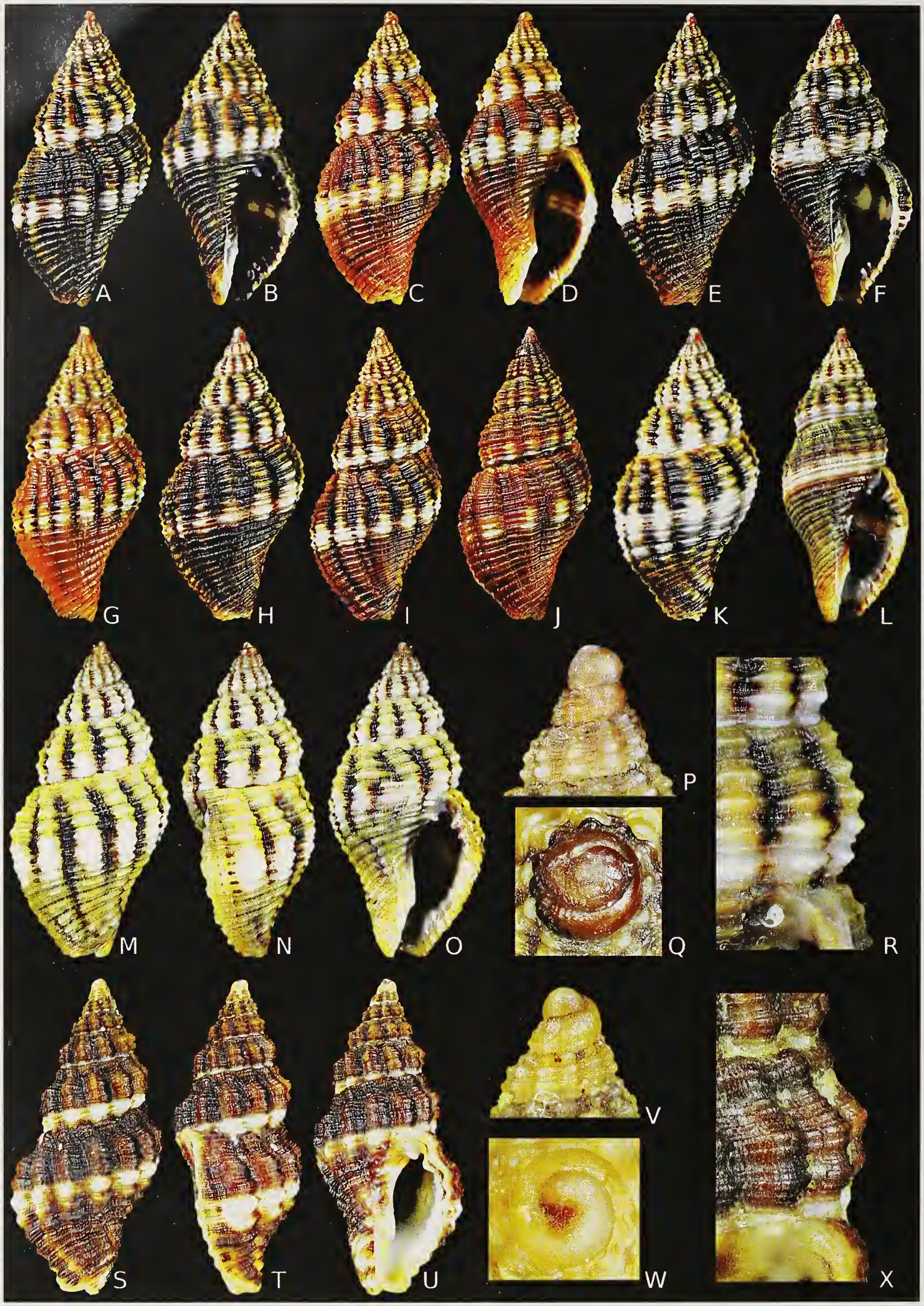

Fig 2. A-R: *Pollia assimilis* (Reeve, 1846). Su Siccu, Cagliari, Italy. 14.1 mm – 19,4 mm; **S-X:** *Pollia dorbignyi* (Payraudeau, 1826). Corfù, Greece, 1 m. 15.9 mm.

Fig 2. A-R: *Pollia assimilis* (Reeve, 1846). Su Siccu, Cagliari, Italia. 14,1 mm – 19,4 mm; **S-X:** *Pollia dorbignyi* (Payraudeau, 1826). Corfù, Grecia, 1 m. 15,9 mm.

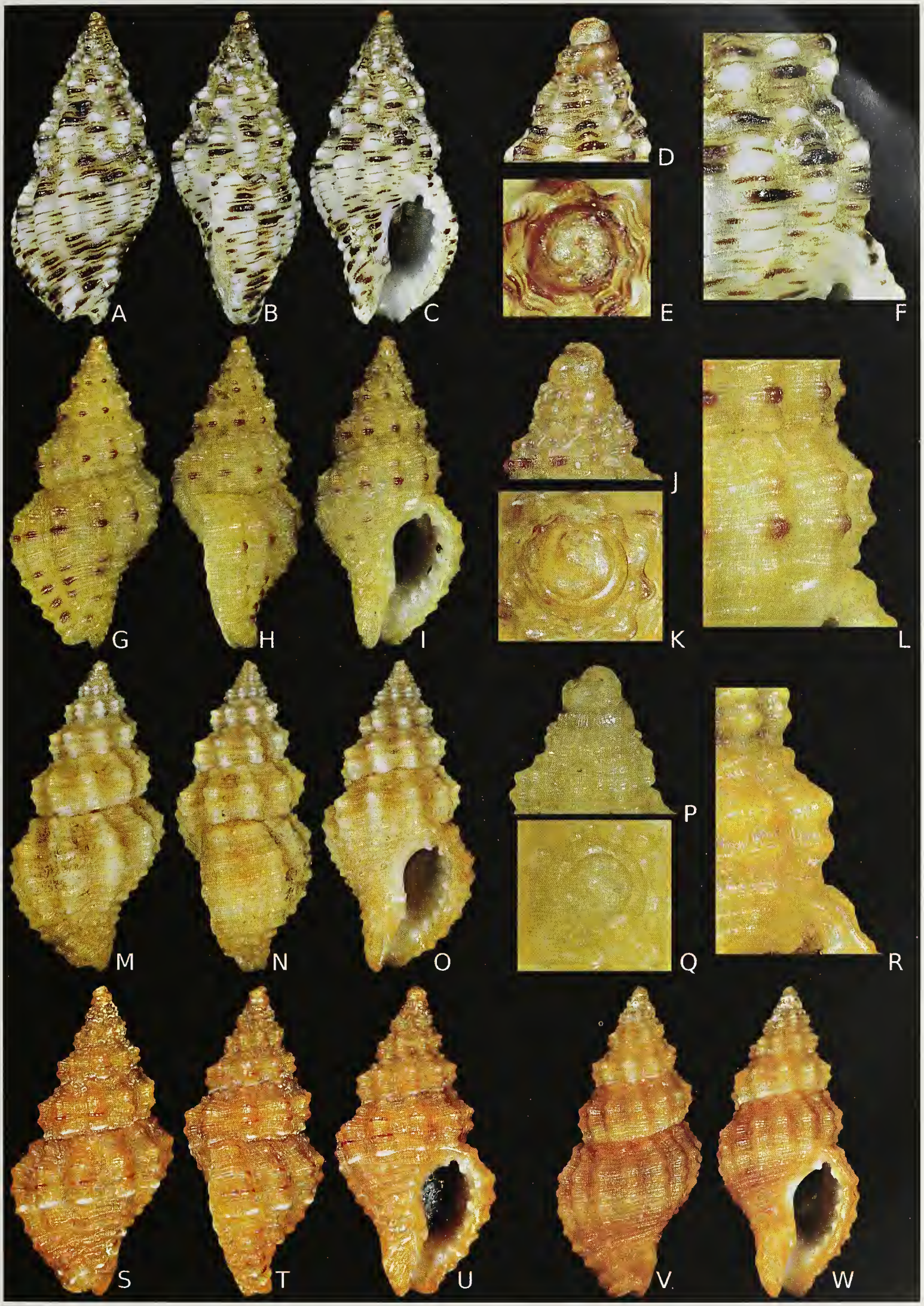

Fig 3. A-F: *Pollia scacchiana* (Philippi, 1844). Chalkidiki, Greece, 5 m. 9.9 mm; **G-L:** *Pollia scabra* (Locard, 1886). Anacapri, Italy, 18 m. 12.5 mm; **M-R:** *Pollia campisii* (Ardovini, 2015). Acitrezza, Italy, 150-200 m. 16 mm; **S-U:** *Pollia campisii* (Ardovini, 2015). Siracusa, Italy, 50/80 m. 10.3 mm; **V-W:** *Pollia campisii* (Ardovini, 2015). Siracusa, Italy, 50/80 m. 13.4 mm.

Fig 3. A-F: *Pollia scacchiana* (Philippi, 1844). Calcidica, Grecia, 5 m. 9,9 mm; **G-L:** *Pollia scabra* (Locard, 1886). Anacapri, Italia, 18 m. 12,5 mm; **M-R:** *Pollia campisii* (Ardovini, 2015). Acitrezza, Italia, 150-200 m. 16 mm; **S-U:** *Pollia campisii* (Ardovini, 2015). Siracusa, Italia, 50/80 m. 10,3 mm; **V-W:** *Pollia campisii* (Ardovini, 2015). Siracusa, Italia, 50/80 m. 13,4 mm.

but *P. assiuuilis* one has more numerous whorls (*P. assimilis*: 2 vs *P. scacchiana*: 1.75) (**Fig. 3. D-E**). Furthermore, the shell color pattern is rather different: *P. assimilis* is tinged with green on axial ribs and brown in the interspaces between ribs, with a distinct white band on spire whorls (**Fig. 2. A-O**). *P. scacchiana* has black and white dots and black lines spirally arranged following cords (**Fig. 3. A-C, F**).

P. assiuuilis considerably differs from *P. scabra* (**Fig. 3. G-L**) in having a higher number of spiral cords (*P. assimilis*: 5 primary, 11 secondary *vs P. scabra*: 3 primary, 9 secondary) (**Fig. 3. L**) and a higher number of axial ribs (*P. assimilis*: 12-13 *vs P. scabra*: 8-9). *P. scabra* also shares with *P. dorbiguyi* the presence of a strong subsutural cord (**Fig. 3. L**), although weaker than the latter, which is absent in *P. assiuuilis*. *P. assimilis* protoconch resembles the *P. scabra* one, but has different whorls (*P. assimilis*: 2 *vs P. scabra*: 1.75) (**Fig. 2. J-K**). Shell color pattern is also very different: *P. scabra* has a light color with dark dots at intersections between axial and spiral cords but may also show a uniform pattern lacking dots (**Fig. 2. G-I, L**).

Finally, *P. assimilis* differs from *P. caupisii* in having a higher number of spiral cords and axial ribs (**Fig. 2. M-W**). *P. caupisii* also has a subsutural cord (**Fig. 2. R**), which is absent in *P. assimilis*. The protoconch of *P. assimilis* is similar to that of *P. campisii*, with the same number of whorls (**Fig. 2. P-Q**). Shell color pattern is very different: *P. caupisii* has a light uniform color.

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A new species of *Stenoplax* (Mollusca: Polyplacophora: Ischnochitonidae) from southern Madagascar

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Abstract

Stenoplax lavanonensis n. sp. is described from Lavanono, southern Madagascar, living under small and smooth pebbles on reef, at a depth of 0.1-0.4 m. The new species is morphological compared with the two *Stenoplax* species known from Madagascar and the Indian Ocean, *Stenoplax madagassica* (Thiele, 1917) and *Stenoplax alata* (Sowerby, 1841).

Key words

Mollusca, Polyplacophora, new species, *Stenoplax*, Madagascar, Lavanono, Indian Ocean.

Riassunto

[*Una nuova specie di* Stenoplax *(Mollusca: Polyplacophora: Ischnochitonidae) dal sud del Madagascar*] Viene descritta la nuova specie *Stenoplax lavanonensis* da Lavanono, Madagascar meridionale, rinvenuta sul reef ad una profondità di 0,1-0,4 m, sotto ciottoli piccoli e lisci. La nuova specie viene confrontata con le altre due specie conosciute dal Madagascar e dall'Oceano Indiano, *Stenoplax madagassica* (Thiele, 1917) e *Stenoplax alata* (Sowerby, 1841).

Parole chiave: Mollusca, Polyplacophora, nuova specie, *Stenoplax*, Madagascar, Lavanono.

Introduction

Madagascar plays an important role in the context of Indo-Pacific marine biodiversity and biogeography because of the presence of one of the world's longest barrier reefs, off Tuléar (Spalding et al., 2001). In recent years, the chiton fauna of Madagascar has been the subject of a number of studies, resulting in the discovery of new species, in a better appreciation of the taxonomy of some particularly elusive species and in a reconsideration of their geographic distribution (Leloup, 1981; Kaas, 1986; Dell'Angelo et al., 2004, 2010, 2011, 2012; Prelle et al., 2013). Nevertheless, a comprehensive study of malagasy chitons is yet to be achieved, and the finding of new material allows a better insight into local biodiversity. As part of these studies a new species of *Stenoplax* has been identified and is described below.

Materials and Methods

The studied material was mostly collected in 2007/09 by one of the authors (Giovanni Prelle) at Lavanono, a locality situated in southern Madagascar, 40 km from Cape S. Marie and 60 km from Faux Cap, 25°25'43"S, 44°56'19"E (**Fig. 1**). The specimens were mainly collected from under small and smooth pebbles on reef, at a depth of 0.1-0.4 m.

The partly disarticulated holotype was boiled in 7% KOH during 10-15 minutes then was boiled twice in fresh water. The higher classification used below follows Sirenko (2006).

Fig. 1. Collecting locality (Madagascar, Lavanono).

Fig. 1. Località di rinvenimento (Madagascar, Lavanono).

Abbreviations

BD - Bruno Dell'Angelo collection, Genova, Italy (will be housed in MZB).
MNHN - Muséum National d'Histoire Naturelle, Paris, France.
MZB - Museo di Zoologia dell'Università di Bologna, Italy.
ZISP - Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia.

Systematics

Class Polyplacophora Gray, 1821
Order Chitonida Thiele, 1909
Suborder Chitonina Thiele, 1909
Family Ischnochitonidae Dall, 1889
Genus *Stenoplax* Dall, 1879
Type species: *Chiton limaciformis* Sowerby, 1832, by original designation.

Diagnosis

Of small to large size, elongate, the length 2 to 3 times the width, tail valve relatively large, depressed, mucro subcentral and inconspicuous, slit formula many/1 or more/many, girdle decorated with minute to large, more or less elongate scales, or with stout, bent, striated spines (Kaas & Van Belle 1987: 124).

Genus distribution

Central and East Pacific Ocean (Hawaii, and from Canada to Perù), Indo-Pacific Ocean (from Japan to India), Indian Ocean (Madagascar), East Atlantic Ocean (Gulf of Guinea), West Atlantic Ocean (from Florida to Brazil including the Caribbean). Eocene-Recent.

Remarks

This species was assigned to the genus *Stenoplax* mainly because of the elongate shape, with the length 2 to 3 times the width. Alone, not all characters of the new species match with those of the genus *Stenoplax*. The tail valves of *Stenoplax* species are generally depressed and much more elongate relatively to other valves (Kaas & Van Belle 1987: 124; Vendrasco et al. 2012: 34), but the tail valve is more elevated in our species. However, the same characteristic is seen in other *Stenoplax* species, e.g. *S. marcusi* (Righi, 1971) from Brasil, originally placed in *Ischnochiton*, and later attributed to *Stenoplax* by Kaas and Van Belle (1994) following study of the type material.
Many species of *Ischnochiton* are similar to *Stenoplax* species, and a revision of the genus *Ischnochiton* is necessary to clarify the differences with *Stenoplax*, but this is beyond the scope of the present study. The genus *Stenoplax* is currently divided in two subgenera, *Stenoplax* s.s. (having the insertion plates of intermediate valves single-slitted), and *Stenoradsia* Dall, 1879 (having the insertion plates of intermediate valves multi-slitted) (Kaas & Van Belle, 1987). This single, shared attribute does not reflect phylogenetic affinity amongst the scattered, non-Eastern Pacific species (Eernisse pers. comm.), so we do not consider an attribution at subgeneric level.

Stenoplax lavanonensis n. sp.
Figs 2-5

Type material

Holotype: ZISP 2248, body length 17.5 mm, now partly disarticulated. Paratypes (all from the type locality): ZISP 2249 (4 spm); MNHN IM-2014-6055 (3 spm); MZB 32055 (3 spm); BD 124 (3 spm).

Material examined

The type material and additional 15 specimens, all from the type locality.

Type locality

Madagascar, Lavanono.

Etymology

Named for Lavanono, the type locality of the species.

Diagnosis

Animal of medium size, elongate oval, colour of tegmentum and girdle uniformly light orange. Valves moderately elevated, rounded, not beaked, tail valve larger than head valve. Tegmentum sculptured with irregularly undulate concentric grooves crossed by many weak, radial riblets in head valve, lateral areas of intermediate valves, and postmucronal area of tail valve, and by longitudinal grooves slightly obliquely directed in central area of intermediate valves and antemucronal area of tail valve, more irregular and tending to coalesce in jugal area. Slit formula 15 / 2-3 / 11. Girdle densely covered with dorsal imbricating scales with ca. 30-35 riblets on each and ventral smooth spicules. Major lateral tooth of radula with a four-cusped head.

Description

Data from holotype, unless otherwise mentioned. Animal of medium size (**Fig. 2**), holotype 17.5 mm (maximum size 21 x 9 mm), elongate oval, much longer than twice the width, moderately elevated (dorsal elevation of valve V: 0.37), back evenly rounded with convex side slopes. Colour of tegmentum uniformly light orange, somewhat variegated with sandy brown flecks, sometimes the central area of valve II a bit more dark. Girdle of the same colour.
Head valve semicircular (**Fig. 3A**), posterior margin

Fig. 2. *Stenoplax lavanonensis* n. sp., Paratype ZISP 2249, Lavanono: whole animal, lateral and dorsal views.

Fig. 2. *Stenoplax lavanonensis* n. sp., Paratipo ZISP 2249, Lavanono: esemplare intero, viste laterale e dorsale.

widely V-shaped. Intermediate valves (**Fig. 3B**) with anterior margin slightly concave and obliquely posteriorly directed at both sides, side margins rounded, posterior margin about straight, apices hardly or not indicated, lateral areas well raised. Tail valve semicircular (**Fig. 3C**), larger than head valve, length ca. 2/3 of the width, anterior margin concave in the central part, mucro central, little indicated, antemucronal slope slightly convex (**Fig. 3F**), postmucronal slope almost straight, very slightly concave just behind the mucro.

Head valve, lateral areas of intermediate valves, and postmucronal area of tail valve sculptured with many close-set, more or less obvious concentric grooves, better defined towards the periphery (**Fig. 3D**), crossed by many weak, radial riblets, the riblets gradually becoming obsolete towards the apical region. Central area of intermediate valves and antemucronal area of tail valve ornamented with longitudinal grooves that continue

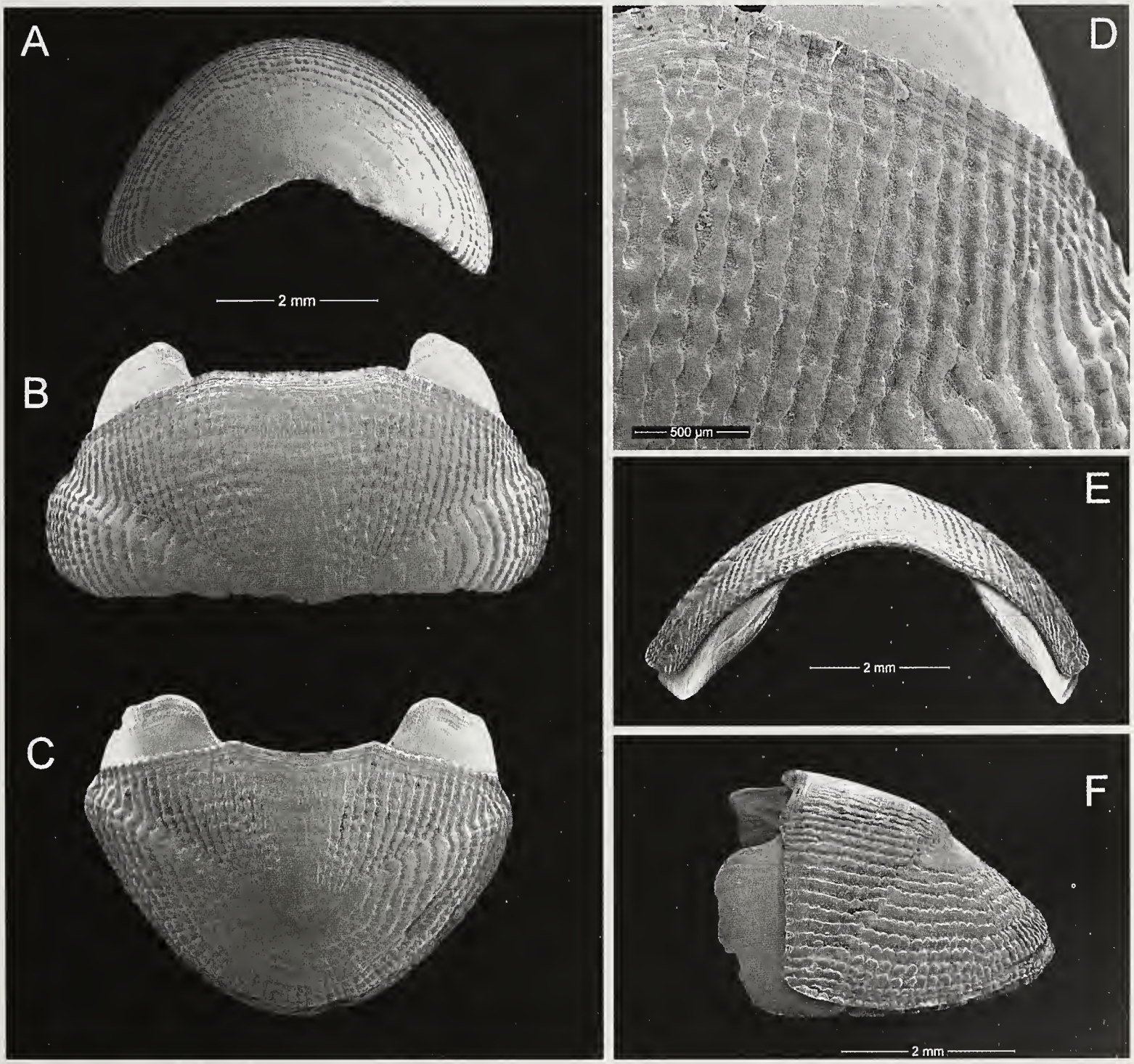

Fig. 3. A-F. *Stenoplax lavanonensis* n. sp., Holotype ZISP 2248, Lavanono. **A.** Head valve, dorsal view. **B.** Intermediate valve, dorsal view. **C.** Tail valve, dorsal view. **D.** Intermediate valve, tegmentum sculpture in pleural area. **E.** Intermediate valve, frontal view. **F.** Tail valve, lateral view.

Fig. 3. A-F. *Stenoplax lavanonensis* n. sp., Olotipo ZISP 2248, Lavanono. **A.** Piastra anteriore, vista dorsale. **B.** Piastra intermedia, vista dorsale. **C.** Piastra posteriore, vista dorsale. **D.** Piastra intermedia, scultura del tegmentum nell'area pleurale. **E.** Piastra intermedia, vista frontale. **F.** Piastra posteriore, vista laterale.

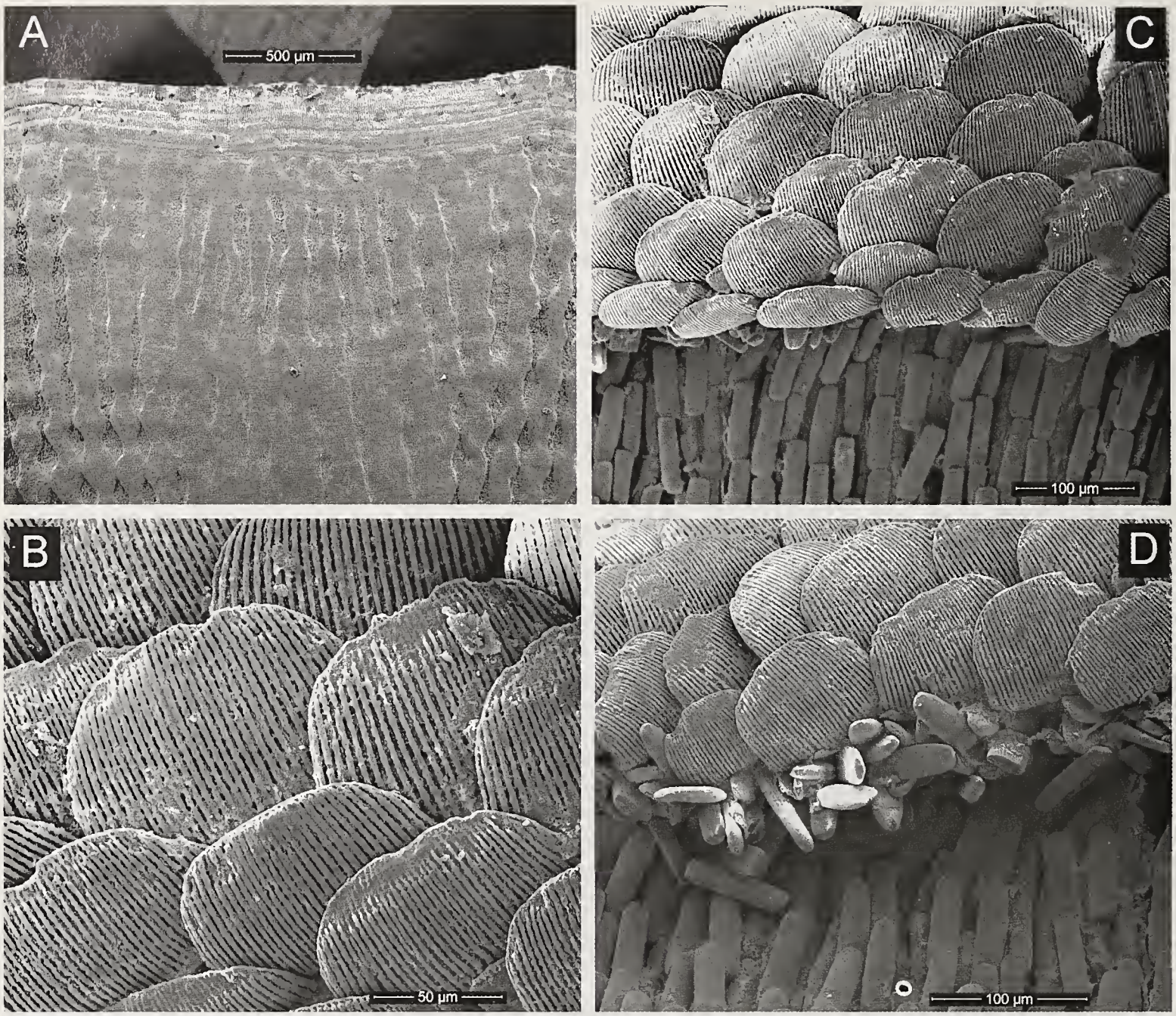

Fig. 4. A-D. *Stenoplax lavanonensis* n. sp., Holotype ZISP 2248, Lavanono. **A.** Intermediate valve, tegmentum sculpture in jugal area. **B.** Dorsal scales. **C, D.** Dorsal scales, marginal spicules and ventral spicules.

Fig. 4. A-D. *Stenoplax lavanonensis* n. sp., Olotipo ZISP 2248, Lavanono. **A.** Piastra intermedia, scultura del tegmentum nell'area jugale. **B.** Scaglie dorsali. **C, D.** Scaglie dorsali, spicole marginali e ventrali.

the concentric grooves from the lateral areas and postmucronal area respectively, slightly obliquely directed; the longitudinal grooves are less evident in the jugal area, where they are more irregular, larger, and tending to coalesce (**Fig. 4A**).

Articulamentum white. Apophyses triangular, trapezoidal in tail valve, widely separated by a slightly concave jugal sinus in intermediate valves, more concave in tail valve, insertion plates short, slit formula 15 / 2-3 / 11. All intermediate valves with 2 slits except right side of valve II, with 3 distinct slits.

Girdle (in situ measurements) dorsally densely covered with small, trapezoid, round-topped, slightly bent, imbricating scales (**Fig. 4B**), rounded at the top, up to 100 µm wide and 80 µm long, with 30-35 narrow riblets, interstices narrower. Marginal spicules simple (**Fig. 4D**), smooth, straight, bluntly pointed up to 90 µm long. Ventrally, the girdle is paved with radiating rows of small, smooth, rectangular, round-tipped spicules (**Fig. 4D**), up to 65 x 17 µm.

Radula of holotype 6.5 mm long with 50 transverse rows of mature teeth. Central tooth of radula small and narrow (**Fig. 5C**), first lateral tooth wider (**Fig. 5B**), major lateral tooth with a four-cusped head (**Fig. 5D**), denticles bluntly pointed, the two central ones longer than the others; minute granulations on the upper surface of the two central cusps.

Holotype has 22 gills on each side extending from valve II to the end of valve VII. Paratype (ZISP 2249), with body length 20.0 mm has 23 gills on each side and arrangement of nephropore between 3-4 gills and gonopore between 6-7 gills from the end of body.

Remarks

The genus *Stenoplax* is known for 22 living worldwide species (Gofas, 2015), more than half of which occur in the northern temperate or tropical eastern Pacific, few other species occur exclusively in the Caribbean (one species, *Stenoplax boogii* [Haddon, 1886] is reported in both regions), and the remaining occur in the Indo-Pacific, Ja-

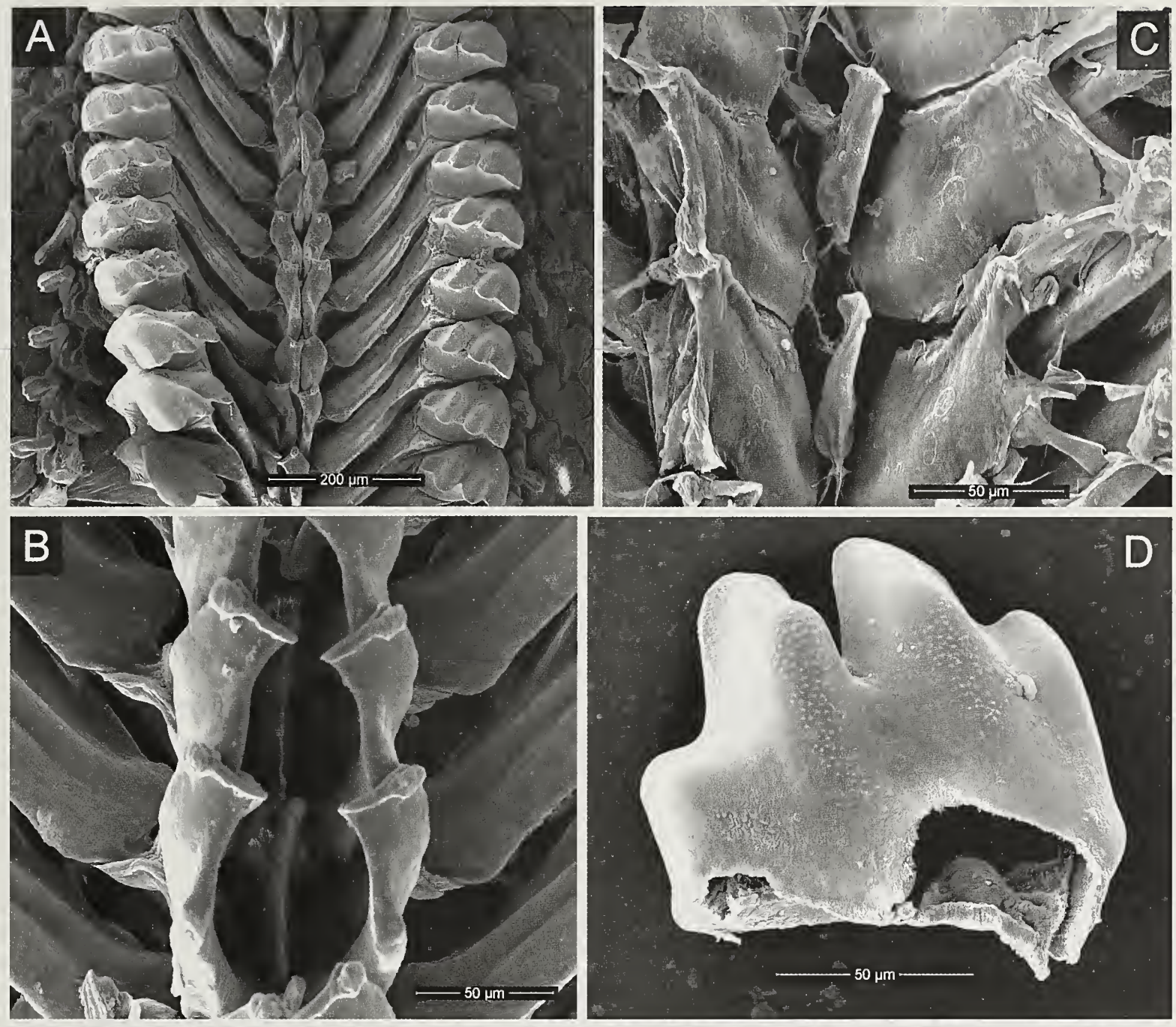

Fig. 5. A-D. *Stenoplax lavanonensis* n. sp., Holotype ZISP 2248, Lavanono. **A.** Radula. **B.** Central and first lateral teeth. **C.** Central portion of radula. **D.** Four-cusped head of major lateral tooth.

Fig. 5. A-D. *Stenoplax lavanonensis* n. sp., Olotipo ZISP 2248, Lavanono. **A.** Radula. **B.** Denti centrale e primo laterale. **C.** Porzione centrale della radula. **D.** Testa con quattro cuspidi del secondo dente laterale.

pan, and western Atlantic (Brazil) (Kaas & Van Belle, 1987, 1990). Only two species are known from the Indian Ocean, *Stenoplax madagassica* (Thiele, 1917), an uncommon species also reported only from Madagascar, on the Tamatave reef in the East, and on the coral reef of Tuléar in the South West (Kaas, 1986; Kaas & Van Belle, 1987), and *S. alata* (Sowerby, 1841), a widespread species in the Indo-Pacific between India and Taiwan (Kaas & Van Belle, 1987), and also reported from Japan (Taki, 1954).

Stenoplax lavanonensis n. sp. differs from *S. madagassica* by the sculpture (smooth and glossy in *S. madagassica*, with scarce evidence of longitudinal grooves only near the anterior margin of the valves), the girdle (dorsal scales more wide than long in *S. lavanonensis*, 100 x 80 µm vs. 78 x 145 µm, with a greater number of longitudinal riblets, 30-35 vs. ca. 18, and no presence of ring-shaft-needles along the margin), and the radula (major lateral tooth with tricuspid head in *S. madagassica*, four-cusped in *S. lavanonensis*).

Kaas (1986: 11) considered *Ischnochiton simnosus* Leloup, 1981 and *I. simnosus* var. *varius* Leloup, 1981, both from the Tulear reef, as synonyms of *Stenoplax madagassica*, and we confirm this synonymy, on the basis of Leloup's description and the photo of Holotype (MNHN-IM-2000-6089) of *I. simnosus* (Odido et al., 2015).
Stenoplax lavanonensis n. sp. differs from *S. alata* by having 2-3 slits in intermediate valves (vs. 1 slit in *S. alata*) and four cuspid head of major lateral teeth (vs. tricuspid in *S. alata*).
The new species *Stenoplax lavanonensis* has the major lateral tooth four-cuspid, and this character is shared only by one of the 22 living worldwide species of the genus, *Stenoplax conspicua* (Carpenter MS, Pilsbry, 1892).

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54 *Egidio Trainito & Mauro Doneddu*
Contribution to the knowledge of the molluscan fauna in the Marine Protected Area Tavolara-Punta Coda Cavallo: Ordo Nudibranchia
71 *Pasquale Micali & Danilo Scuderi*
On the validity of *Mactra paulucci* Aradas & Benoit, 1872 with notes on the taxonomy of the genus (Bivalvia, Mactridae)
79 *Paolo Russo*
On the systematic position of *Murex syracusanus* Linnaeus, 1758 (Gastropoda, Fasciolariidae) with revaluation of the genus *Aptyxis*
87 *Andrea Nappo & Sergio Loi*
First record of *Pollia assimilis* (Reeve, 1846) (Gastropoda: Buccinidae) from Italy
91 *Bruno Dell'Angelo, Boris Sirenko & Giovanni Prelle*
A new species of *Stenoplax* (Mollusca: Polyplacophora: Ischnochitonidae) from southern Madagascar

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